

Project Management Professional (PMP)



Presented by :
Abdulfattah Ajlan
Certified PMP Trainer



Welcome

- **Course : Project Management. Professional - PMP**

Presented by : **Abdulfattah Ajlan**

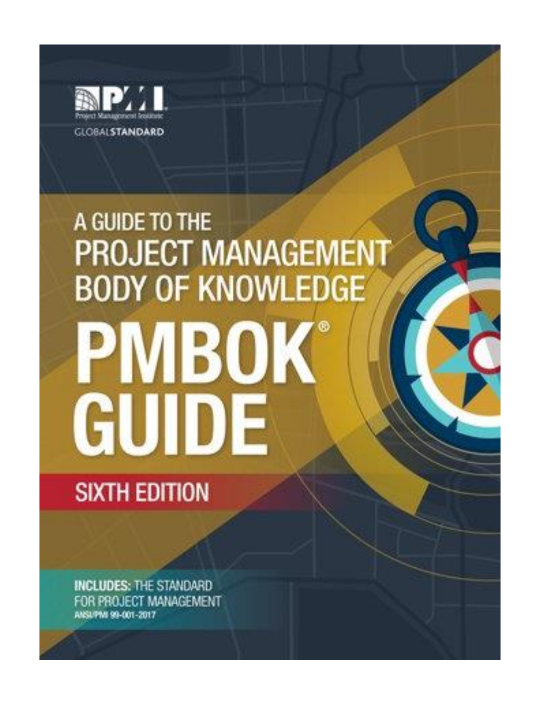
Education: Bachelor civil Engineering & Master in Engineering Management

Experience: 10 Years in Projects Management

Current Position: Senior Project Engineer

Training Experience: PMP, Finance and Management Certified Trainer.











Course References & Tools



Sessions (6 Days)			
Thursday	6:30–7:30	7:45-8:45	9:00-10:30
Friday & Saturday	6:30–7:30	7:45-8:45	9:00-10:30

Training Topics Plan	
Day	Topic
Thursday	Introduction - Projects Environment - PM role
Friday	Integration – Scope
Saturday	Scheduling - Cost
Thursday	Quality - Resource
Friday	Communication - Risk
Saturday	Procurement - Stakeholder



Project *Management* Certifications



Content is based on "A Guide To The Project Management Body Of Knowledge" Sixth Edition (PMBOK), and others sources.

The Owner:

Project Management Institute (PMI)

- Not-for-profit professional association. primary goal is to advance the practice, science and profession of project management.
- Recognized since 1969 by working PMs.
- Headquartered in Pennsylvania USA.



Fact File



PMI Fact File

Statistics through 31 May 2020

TOTAL MEMBERS 602,213 ...in 214 countries and territories

PMI has 301 chartered and 10 potential chapters

CERTIFICATIONS
Total Active Holders of:

Certification	Holders
CAPM® Certified Associate in Project Management	42,647
PMI-ACP® PMI Agile Certified Practitioner	35,182
PMI-PBA® PMI Professional in Business Analysis	4,159
PMI-RMP® PMI Risk Management Professional	5,715
PMI-SP® PMI Scheduling Professional	2,103
PMP® Project Management Professional	1,037,653
PgMP® Program Management Professional	2,907
PfMP® Portfolio Management Professional	823

...nagement Institute

THIS IS TO CERTIFY THAT

Kalpesh S. Patil

HAS BEEN FORMALLY EVALUATED FOR DEMONSTRATED EXPERIENCE, KNOWLEDGE AND PERFORMANCE IN ACHIEVING AN ORGANIZATIONAL OBJECTIVE THROUGH DEFINING AND OVERSEEING PROJECTS AND RESOURCES AND IS HEREBY BESTOWED THE GLOBAL CREDENTIAL

Project Management Professional (PMP)®

IN TESTIMONY WHEREOF, WE HAVE SUBSCRIBED OUR SIGNATURES UNDER THE SEAL OF THE INSTITUTE

Randall T. Black
Chair, Board of Directors

Sunil Prashara
President and Chief Executive Officer

PMP® Number: 2645444
PMP® Original Grant Date: 03 October 2019
PMP® Expiration Date: 02 October 2022

Project Management Institute.

PMP Exam Requirements



To be eligible for PMP Certification, you will need to demonstrate that you meet certain minimum criteria as below:

❑ University Degree,

- ✓ 4,500 hours of project management experience,
- ✓ 35 hours of project management education.

❑ High school, diploma or equivalent

- ✓ 7,500 hours of project management experience,
- ✓ 35 hours of project management education.

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PROJECT MANAGEMENT INSTITUTE CORPORATE SEAL 1969 PENNSYLVANIA

PMP® Number: 2645444
PMP® Original Grant Date: 03 October 2019
PMP® Expiration Date: 02 October 2022

PMI Project Management Institute.

Price:	Exam	Re-Exam
Member:	$ 405	$ 275
Non-member:	$ 555	$ 375

Price:	Membership
Normal:	$ 139
Student:	$ 32



PMP Exam

- 200 questions in 4 Hours (1 min & 12 Seconds for each question) .
- There are 25 questions considered for use on future exams.
- However, they do not count toward your grade and you will not know which questions count and which don't.
- To pass, you have to answer **106** graded questions correctly out off **175**. That translates to 61%.





PMP Existing Exam

Domain	Percentage of Items on Test
Initiating	13%
Planning	24%
Executing	31%
Monitoring and Controlling	25%
Closing	7%
Total	100%

PMP Future Exam
DEC 2020

Domain	Percentage of Items on Test
People	42%
Process	50%
Business Environment	8%
Total	100%

PMP examination content

Validity



- The credential is valid for 3 Years.
- Candidates must recertify every 3 years by earning 60 Professional Development Units (PDUs).
- How to earn 60 PDU?
  - Course or Training.
  - Work as a Practitioner.
  - Create Content.
  - Give a Presentation.
  - Organization Meetings.
  - Volunteer.
  - Read.
  - Share Knowledge.



CAPM Certificate

Certified Associate in Project Management (CAPM)®



Requirements:

- Secondary degree (high school diploma, associate's degree or the global equivalent).
- 23 hours of project management education completed by the time you sit for the exam.

CAPM Exam:

150 questions in 3 hours.

Price:

- Member: US$225.00
- Non-member: US$300.00

Validity:

To maintain your CAPM, you must retake the exam every five years.



1. INTRODUCTION
PROJECT MANAGEMENT



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What is a Project



Project is a temporary endeavor undertaken to create a unique product, service, or result.



The end of the project is reached when

1. The project's objectives have been achieved.
2. The objectives will not or cannot be met.
3. Funding is exhausted.
4. The need for the project no longer required.
5. Terminated for legal cause or convenience.

Fundamental elements of Project



- **Projects drive change:** the project moving the organization from one state to another state.
- **Projects enable business value creation** **By** create benefits to Organization.
- Benefits may be tangible or intangible or both

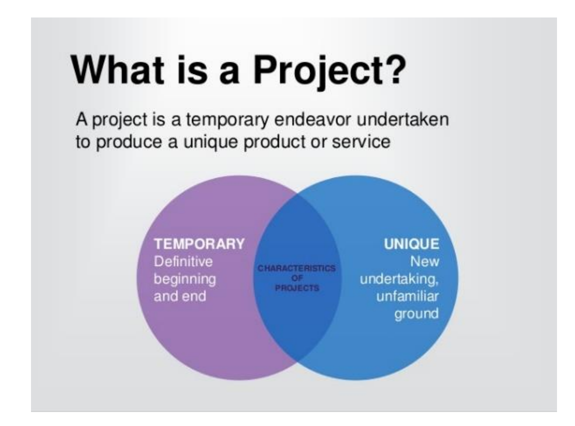


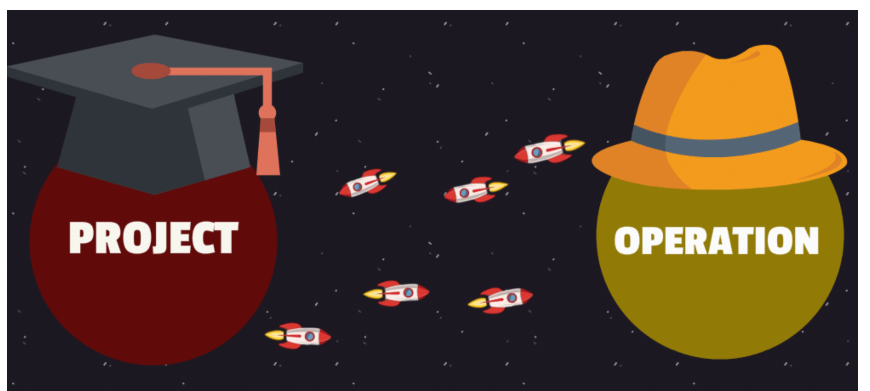
Why Project Established?

- ➢ Meet legal, or social requirements;
- ➢ Satisfy stakeholder requests.
- ➢ Implement or change business or technological strategies.
- ➢ Create, improve, or fix products, processes, or services

Projects Vs. Operational Work









Project	Operation
Temporary	Ongoing
Create a unique product, service, or result	Produce repetitive products, services, or results
Moving the organization from one state to another state	Work sustain the organization overtime

Importance of Project management



Project management

Is the application of knowledge, skills, tools, and techniques to project activities to meet the project requirements.



Project Management enables organizations to execute projects effectively and efficiently

Project:

Managed as a stand-alone project, within a program, or within a portfolio, to get project objective.

Portfolio:

Is a projects, programs, subsidiary portfolios, and operations managed as a group to achieve strategic objectives.

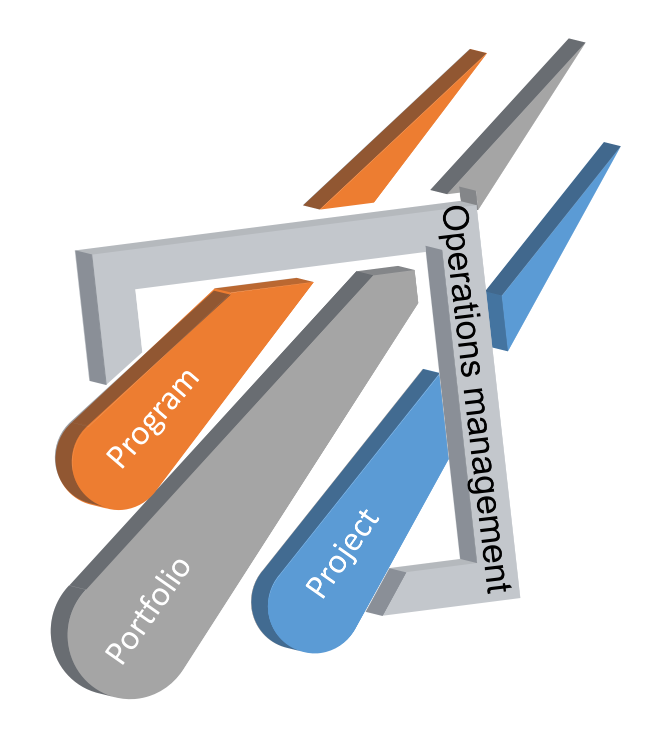
Program:

Group of related projects, subsidiary programs, and program activities managed in a coordinated manner to obtain benefits not available from managing them individually.

Relation between Project, Program, Portfolio,& Operations



- **Operations management** concerned with **ongoing** production of goods and/or services.



- **Program and project management** focus on doing programs and projects the **"right" way**.

- **Portfolio management** focuses on doing **the "right" programs and projects**.



Relation between Project, Program, Portfolio,& Operations



Strategic Objectives

Benefits

Objectives

Organizational Strategy

Portfolio

Program A

Program B

Portfolio A

Program B1

Program C

Project 1

Project 2

Project 3

Project 4

Project 5

Project 6

Project 7

Project 8

Project 9

Operations

Shared Resources and Stakeholders



رؤية المملكة العربية السعودية 2030

96 هدف استراتيجي

12 برنامج



برنامج خدمة ضيوف الرحمن

برنامج التحول الوطني



برنامج صندوق الاستثمارات العامة



برنامج تطوير الصناعة الوطنية والخدمات اللوجستية

برنامج تطوير القطاع المالي

برنامج تحسين نمط الحياة



برنامج ريادة الشركات الوطنية

برنامج الشراكات الاستراتيجية



برنامج الاسكان

برنامج التخصيص

برنامج تعزيز الشخصية الوطنية

برنامج تحقيق التوازن المالي

مبادرات

مشروع 9	تشغيل 1	مشروع 7	مشروع 6	مشروع 5	مشروع 4	مشروع 3	مشروع 2	مشروع 1

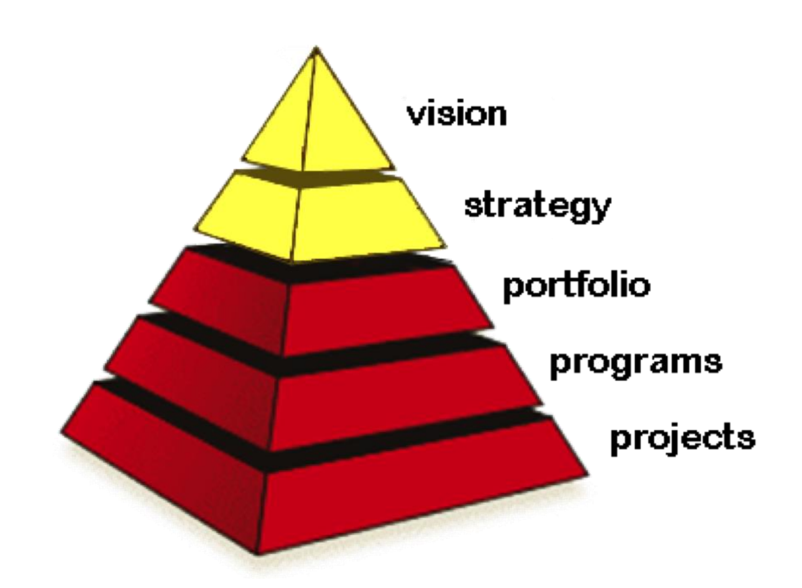
العمق العربي والإسلامي - قوة استثمارية رائدة - ومحور ربط القارات الثلاث



Organizational Project Management (OPM).

Defined as a **framework** in which portfolio, program, and project management are **integrated** with organizational enablers in order **to achieve strategic objectives**.

Ensure that the organization undertakes the **right projects**. Allocates **critical resources** appropriately. Ensure that all levels in the organization **understand the strategic vision**, **the initiatives** that support the vision, the objectives, and the deliverables.



Organizational Project Management (OPM).



Organizational Environment

Portfolio Review and Adjustments

Strategy

Portfolio: Value Decisions

Programs and Projects: Results Delivery

Operations: Business Value Realization

Business Impact Analysis

Value Performance Analysis

Project Life cycle



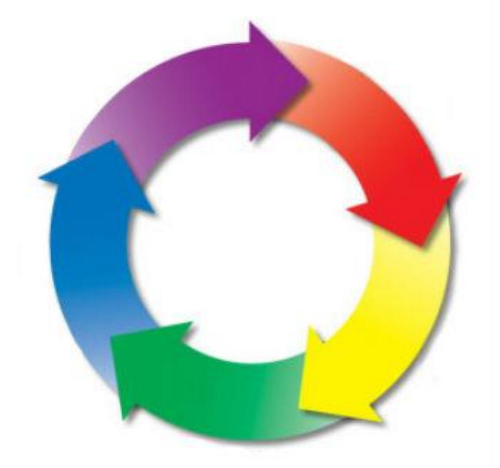
Project life cycle

Is the series of phases that a project passes through from its start to its completion.

It provides the Basic Framework for managing the project.

Project life cycles can be **Predictive** or **Adaptive** to accomplish the product.

- **Predictive life cycle** (waterfall) scope, time, and cost are determined in the early phases.
- **Adaptive life cycles** are **agile** or **change-driven** life cycles, it can be iterative, or incremental. The detailed scope is defined and approved before the start of an iteration.



It is up to the project management team to determine the best life cycle for each project.

Project Lifecycle

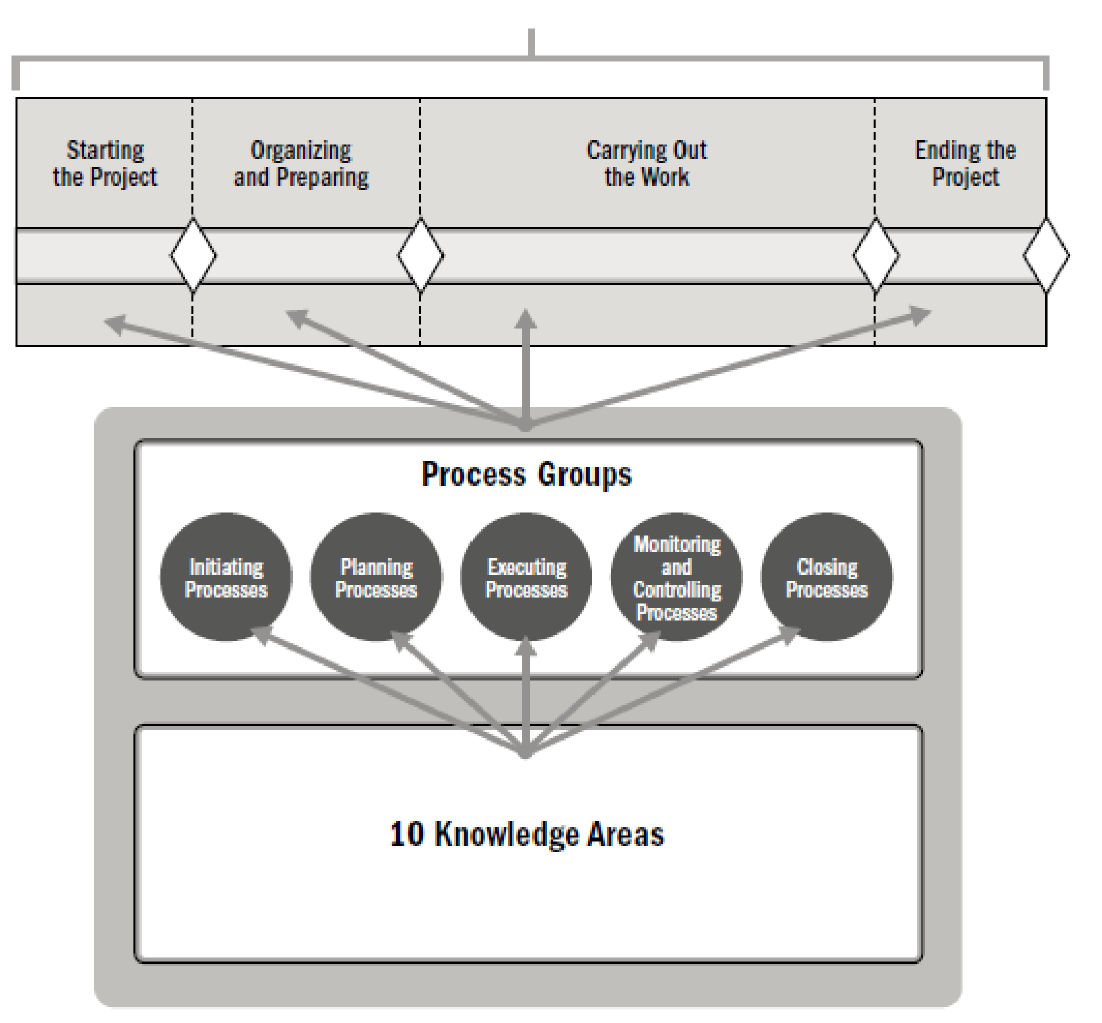


Plan
Approve
Excute
Finish

Process Groups

Initiating Processes
Planning Processes
Executing Processes
Monitoring and Controlling Processes
Closing Processes

10 Knowledge Areas



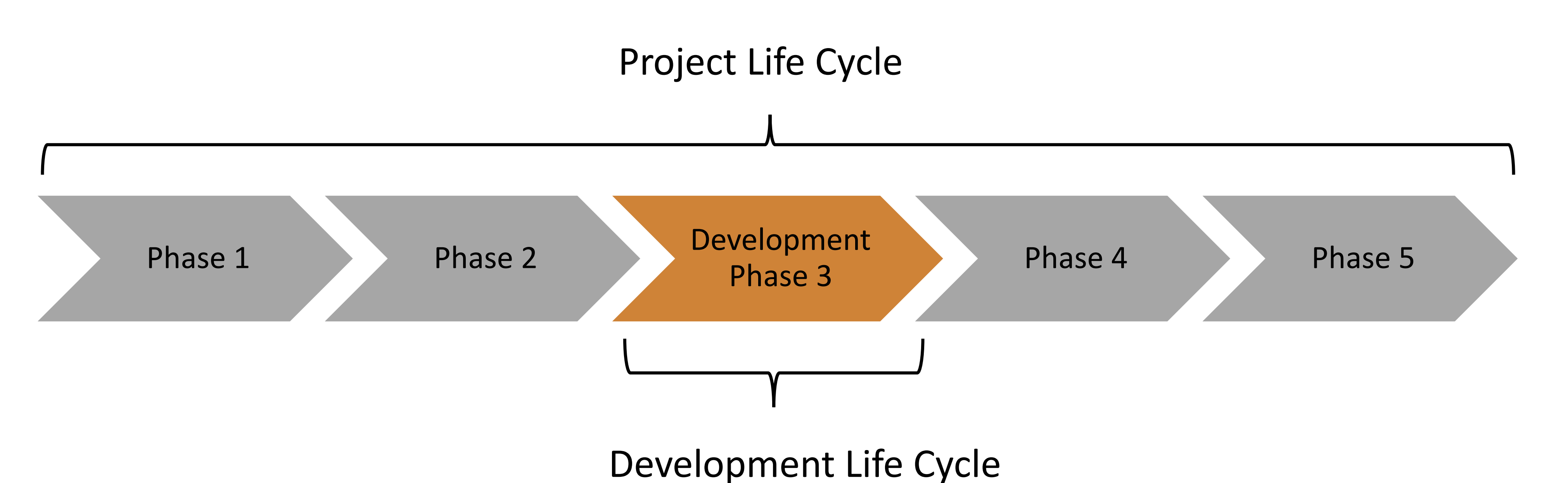
Example 1

Example 2

Development Lifecycle



Development life cycles: one or more phases that are associated with the development.



Development Lifecycle



Development life cycles: one or more phases that are associated with the development.

- **Predictive life cycle** (waterfall) scope, time, and cost are determined in the early phases.
- **Adaptive life cycles** are **agile** or **change-driven** life cycles, iterative, or incremental. The detailed scope is defined and approved before the start of an iteration.
- **Iterative life cycle,** the project scope is generally determined early, but time and cost estimates are routinely modified.
- **Incremental life cycle,** the deliverable is produced through a series of iterations that successively add functionality within a predetermined timeframe.
- **hybrid life cycle** is a combination of a predictive and an adaptive life cycle.

Project Lifecycle





Phase

Is a collection of logically related project activities described by attributes (Name, number, Duration, Resource requirements, etc.)

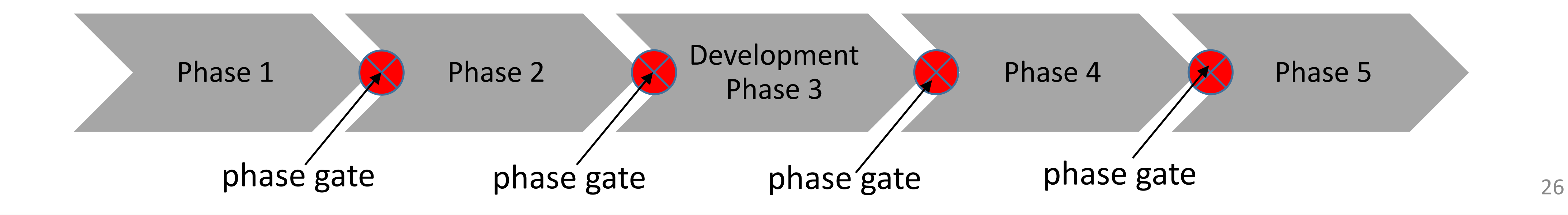


Phase Gate

A phase gate, is held at the end of a phase.

The project's performance and progress are **compared** to project and business documents (business case, Project charter, Project management plan ,Benefits management plan).

May be called (phase review, stage gate, kill point). A decision (e.g., **go/no-go** decision) is made depending on the organization.



Project Lifecycle



Project Life Cycle

DEFINE (G0)	DEFINE (G1)	PLAN (G2)	EXECUTE	EXECUTE (G3)	CLOSE (G4)
Opportunity Identification	**Scope Definition**	**Project Plan**	**Complete Actions / Deliverables**	**Manage & Control**	**Project Close**
Project Charter (preliminary)	Project Charter Statement of Work Work Breakdown Structure (WBS) - Preliminary	Project Plan (checklist) Process Map Risk Assessment Action Items WBS (update) Project Schedule	Action Items Project Schedule Risks	Project Status Document(s)	Final Project Results vs. Planned Final Project Documents (Project History File) Lessons Learned





Project Management Processes

- Every project management process produces one or more outputs from one or more inputs by using appropriate project management tools and techniques.
- Project management processes are logically linked by the outputs they produce.
- Processes may contain overlapping activities that occur throughout the project.

Inputs
Input 1
Input 2
Input 3

Tools & Techniques
Tool 1
Technique 1
Tool 2
Technique 2

Outputs
Output 1
Output 2
Output 3

Project Management Processes





Project Management Process Group

is a logical grouping of project management processes

- Initiating - Planning - Executing - Monitoring and Controlling - Closing



Project management Knowledge Areas:

- Integration Management.
- Scope Management.
- Schedule Management.
- Cost Management.
- Quality Management.
- Resource Management.
- Communications Management.
- Risk Management.
- Procurement Management.
- Stakeholder Management.





Processes generally fall into one of three categories:

- Used once or at predefined points in the project. (Initiating & Closing)
- Processes that are performed periodically as needed (Planning)
- Processes that are performed continuously throughout the project. (Executing & M&C)



Overlap of Process Groups

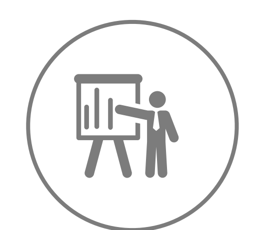
Knowledge Areas	Project Management Process Groups				
	Initiating	Planning	Executing	Monitoring and Controlling	Closing
Project Integration Management	4.1 Develop Project Charter	4.2 Develop Project Management Plan	4.3 Direct and Manage Project Work 4.4 Manage Project Knowledge	4.5 Monitor and Control Project Work 4.6 Perform Integrated Change Control	4.7 Close Project
Project Scope Management		5.1 Plan Scope Management 5.2 Collect Requirements 5.3 Define Scope 5.4 Create WBS		5.5 Validate Scope 5.6 Control Scope	
Project Schedule Management		6.1 Plan Schedule 6.2 Define Activities 6.3 Sequence Activities 6.4 Estimate Activity Durations 6.5 Develop Schedule Management		6.6 Control Schedule	
Project Cost Management		7.1 Plan Cost Management 7.2 Estimate Costs 7.3 Determine Budge		7.4 Control Costs	
Project Quality Management		8.1 Plan Quality Management	8.2 Manage Quality	8.3 Control Quality	
Project Resource Management		9.1 Plan Resource Management 9.2 Estimate Activity Resources	9.3 Acquire Resources 9.4 Develop Team 9.5 Manage Team	9.6 Control Resources	
Project Communications Management		10.1 Plan Communications Management	10.2 Manage Communications	10.3 Monitor Communications	
Project Risk Management		11.1 Plan Risk Management 11.2 Identify Risks 11.3 Perform Qualitative Risk Analysis 11.4 Perform Quantitative Risk Analysis 11.5 Plan Risk Responses	11.6 Implement Risk Responses	11.7 Monitor Risks	
Project Procurement Management		12.1 Plan Procurement Management	12.2 Conduct Procurements	12.3 Control Procurements	
Project Stakeholder Management	13.1 Identify Stakeholders	13.2 Plan Stakeholder Engagement	13.4 Manage Stakeholder Engagement	13.4 Monitor Stakeholder Engagement	





Project Management Data and Information

Project data are regularly collected and analyzed throughout the project life cycle



- **Work performance <u>data</u>.** The raw observations and measurements identified during activities performed to carry out the project work.



- **Work performance <u>information</u>.** The performance data collected from various controlling processes, analyzed in context and integrated based on relationships across areas



- **Work performance <u>reports</u>.** The physical or electronic representation of work performance information.

Project Management Processes



TAILORING is a selection of the appropriate project management processes, inputs, tools, techniques, outputs, and life cycle phases.

- Tailoring is necessary because each project is unique; not every process, tool, technique, input, or output identified.
- Tailoring should address the competing constraints of scope, schedule, cost, resources, quality, and risk.
- The project manager collaborates with the project team, sponsor, organizational management, or some combination thereof.

Project Management Business Documents



Project Business Documents

- **Project business case:** A documented economic feasibility study. lists the objectives and reasons for project initiation. It helps measure the project success at the end of the project against the project objectives.



- **Project benefits management plan**: Is the document that describes how and when the benefits of the project will be delivered and describes the mechanisms that should be in place to measure those benefits.

  A project benefit is defined as an outcome of actions, behaviors, products, services, or results that provide value to the sponsoring. Such as, Revenue, assets, reputation …etc.

Assessment and Critical Business/Project Documents



Project Management Business Documents



Project Charter And Project Management Plan



The Project Charter :

Is defined as a document issued by the project **sponsor** that formally **authorizes** the existence of a project and provides the project manager with the **authority** to apply organizational **resources** to project activities.

The Project Management Plan

Is defined as the document that **describes how** the project will be executed, monitored, controlled and closed.



Project Management Business Documents



Project Success Measures

- Completing the project benefits management plan.
- Meeting the agreed-upon financial measures documented in the business case.
- Meeting business case nonfinancial objectives.
- Completing movement of an organization from its current state to the desired state.
- Fulfilling contract terms and conditions.
- Meeting organizational strategy, goals, and objectives.
- Achieving stakeholder satisfaction.
- Achieving agreed-upon quality of delivery.
- Meeting governance criteria.
- Achieving other agreed-upon success measures or criteria (e.g., process throughput).



Traditionally:

Scope / Time / Cost

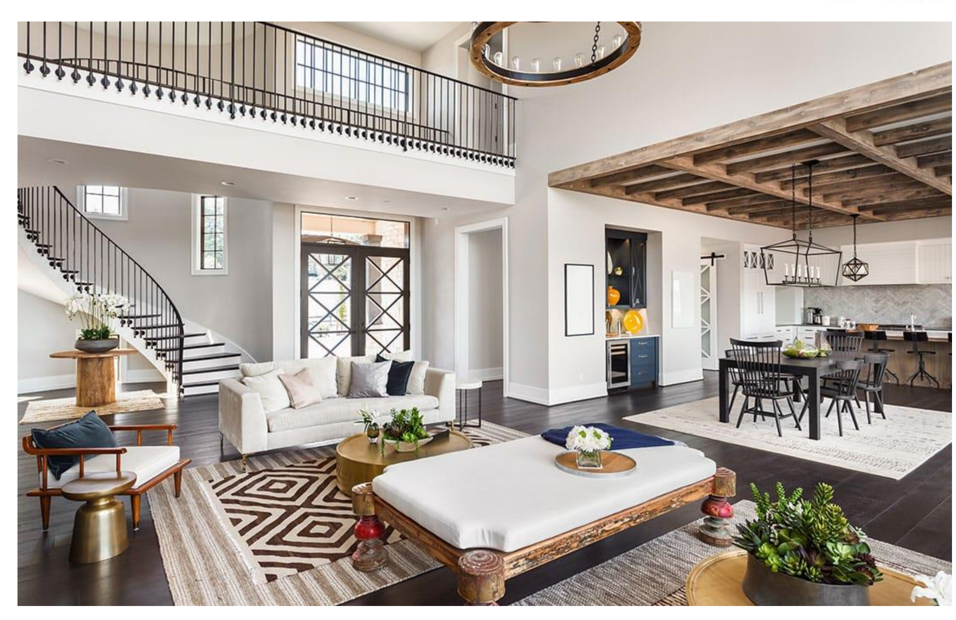
are most important

WORKSHOP















2. THE ENVIRONMENT
IN WHICH PROJECT OPERATE



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Project Environment



Figure 2-1. Project Influences

Project Environment



Enterprise environmental factors

Refer to conditions, not under the control of the project team, that influence, constrain, or direct the project **positive or negative**.

Internal EEFs Examples:

- Resource availability.
- Employee capability.
- Infrastructure.
- Information technology software.
- Organizational culture, structure, and governance.
- Geographic distribution of facilities and resources.

External EEFs Examples:

- Marketplace conditions.
- Social and cultural influences and issues.
- Legal restrictions.
- Commercial databases.
- Government or industry standards.
- Financial considerations.
- Physical environmental elements.

Project Environment



Organizational process assets - OPA

Processes, Policies, Procedures, and Knowledge Bases specific to and used by the performing organization.

- Processes, policies, and procedures
- Organizational knowledge bases





OPA- Processes, Policies, And Procedures

1 **Related to Initiating and Planning**

2 **Executing, Monitoring, and Controlling:**

3 **Related to Closing**

4 **OPA- Organizational knowledge bases**

- Configuration management knowledge repositories.
- Financial data repositories.
- Historical information and lessons learned knowledge repositories
- Issue and defect management data.
- Data repositories for metrics and measurement.
- Project files from previous projects.



Organizational Governance



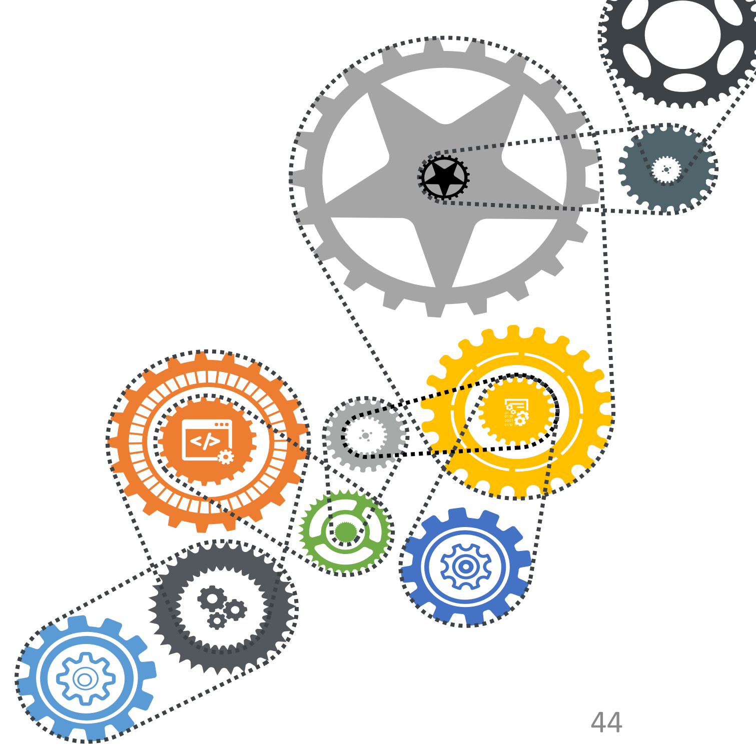
Refers to organizational or structural arrangements at all levels of an organization designed to determine and influence the behavior of the organization's members.

- Includes consideration of people, roles, structures, and policies.
- Requires providing direction and oversight through data and feedback.

Governance Framework

Includes but is not limited to:

- Rules.
- Policies.
- Procedures.
- Norms.
- Relationships.
- Systems.
- Processes.



Governance of Portfolios, Programs, and Projects



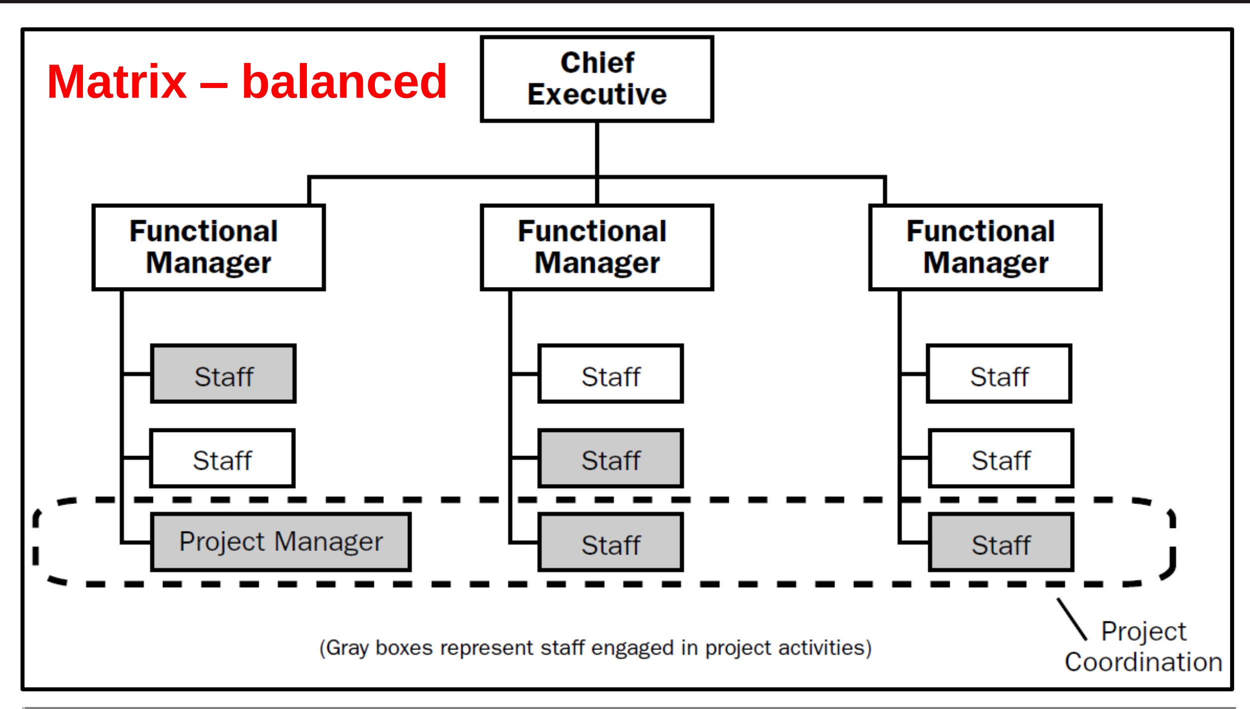
Project governance refers to the framework, functions, and processes that guide project management activities in order to create a unique product, service, or result to meet organizational, strategic, and operational goals.

A governance framework should be **tailored** to the organizational culture, types of projects, and the needs of the organization in order to be effective.

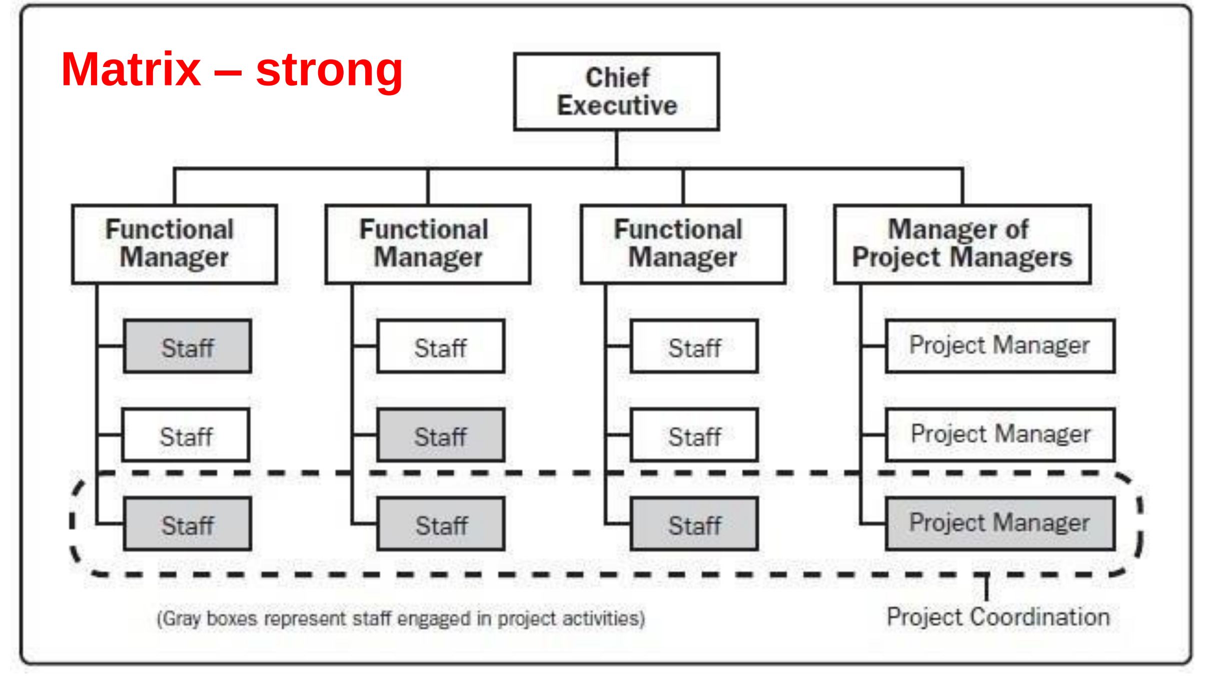
Organizational Structure type

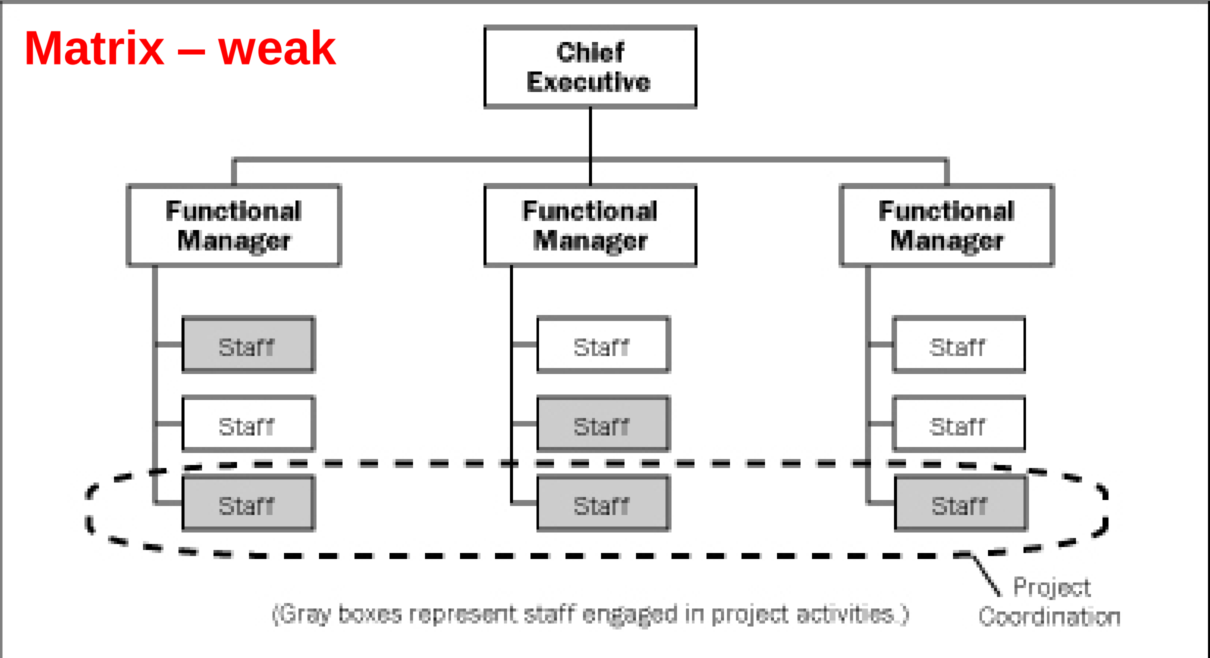


Structure Type	PM Authority	PM Role	Resource Av.	Manages Budget
Organic or Simple	L or none	Part-time; may or may not be a designated job role like coordinator	L or none	Owner
Functional	L or none	Part-time; may or may not be a designated job role like coordinator	L or none	FM
Project-oriented	H to almost total	Full-time designated job role	H to almost total	PM
Matrix – strong	Moderate to high	Full-time designated job role	M to H	PM
Matrix – weak	L	Part-time; done as part of another job and not a designated job role like coordinator	L	FM
Matrix – balanced	L to moderate	Part-time; embedded in the functions as a skill and may not be a designated job role like coordinator	L to moderate	Mixed
Multi-divisional	L or none	Part-time; may or may not be a designated job role like coordinator	L or none	FM
Virtual	L to moderate	Full-time or part-time	L to moderate	Mixed
Hybrid	Mixed	Mixed	Mixed	Mixed
PMO	H to total	Full-time designated job role	H to almost total	PM

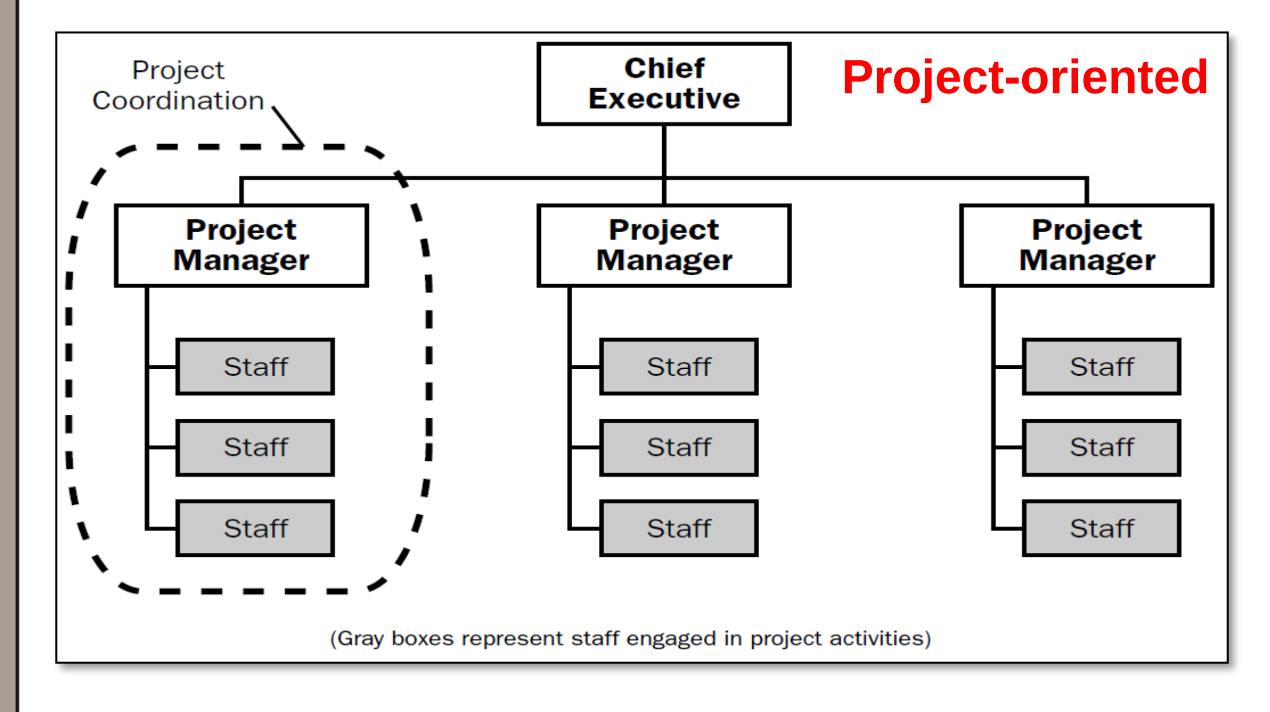

Matrix – balanced
Chief Executive
Functional Manager
Functional Manager
Functional Manager
Staff
Staff
Project Manager
Staff
Staff
Staff
Staff
Staff
Staff
Project Coordination
(Gray boxes represent staff engaged in project activities)

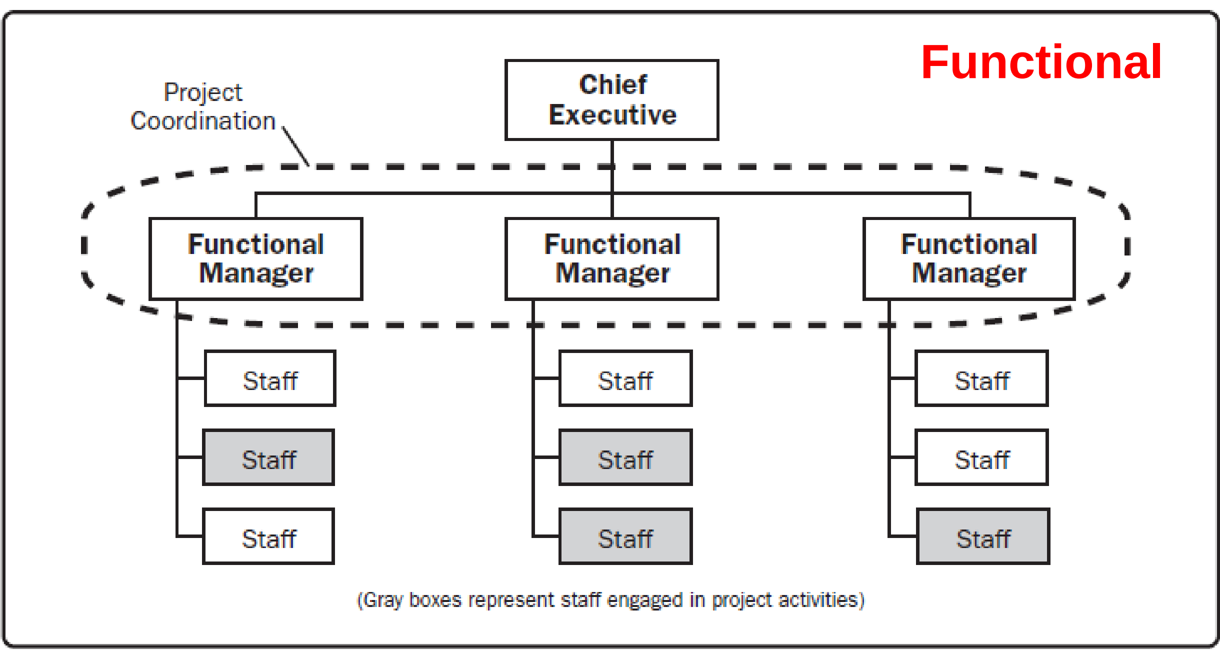

IPMC


Matrix – strong
Chief Executive
Functional Manager
Functional Manager
Functional Manager
Manager of Project Managers
Staff
Staff
Staff
Staff
Staff
Staff
Staff
Staff
Staff
Project Manager
Project Manager
Project Manager
(Gray boxes represent staff engaged in project activities)
Project Coordination


Matrix – weak
Chief Executive
Functional Manager
Functional Manager
Functional Manager
Staff
Staff
Staff
Staff
Staff
Staff
Staff
Staff
Staff
Project Coordination
(Gray boxes represent staff engaged in project activities.)


IPMC


Project-oriented
Project
Coordination
Chief
Executive
Project
Manager
Project
Manager
Project
Manager
Staff
Staff
Staff
Staff
Staff
Staff
Staff
Staff
Staff
(Gray boxes represent staff engaged in project activities)


Functional
Project
Coordination
Chief
Executive
Functional
Manager
Functional
Manager
Functional
Manager
Staff
Staff
Staff
Staff
Staff
Staff
Staff
Staff
Staff
(Gray boxes represent staff engaged in project activities)

Organizational Structure type



Project management office PMO



Project management office

PMO is an organizational structure that **standardizes** the project-related governance processes and **facilitates** the sharing of resources, methodologies, tools, and techniques

Low-Control
Supportive PMO
Provides service support to project managers

PMO Models

Moderate Control
Controlling PMO
Offers consultantion and supervises project policies

High Control
Directive PMO
Takes over the project and its execution

Supportive

- Provide a consultative role by **supplying** templates, best practices, training, access to information, and lessons learned from other projects.

Controlling

- **Provide** support and **require compliance**
- The degree of control is moderate.

Directive

- Directly **managing** the projects.
- Project managers are assigned by and report to the PMO.
- The degree of control is high.

Project management office PMO



A primary function of a PMO is to support project managers by:

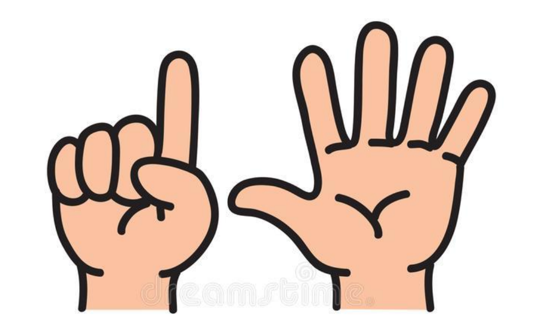


- Managing shared resources across all projects.
- Identifying and developing project management methodology, best practices, and standards.
- Coaching, mentoring, training, and oversight.
- Monitoring project compliance and project audits.
- Developing and managing project policies, procedures, templates, and other shared documentation (OPA).
- Coordinating communication across projects.





Project Stakeholders:



1. Person
2. Group
3. Impact
4. Be impacted
5. Positively
6. Negatively





3. THE ROLE OF PROJECT MANAGER



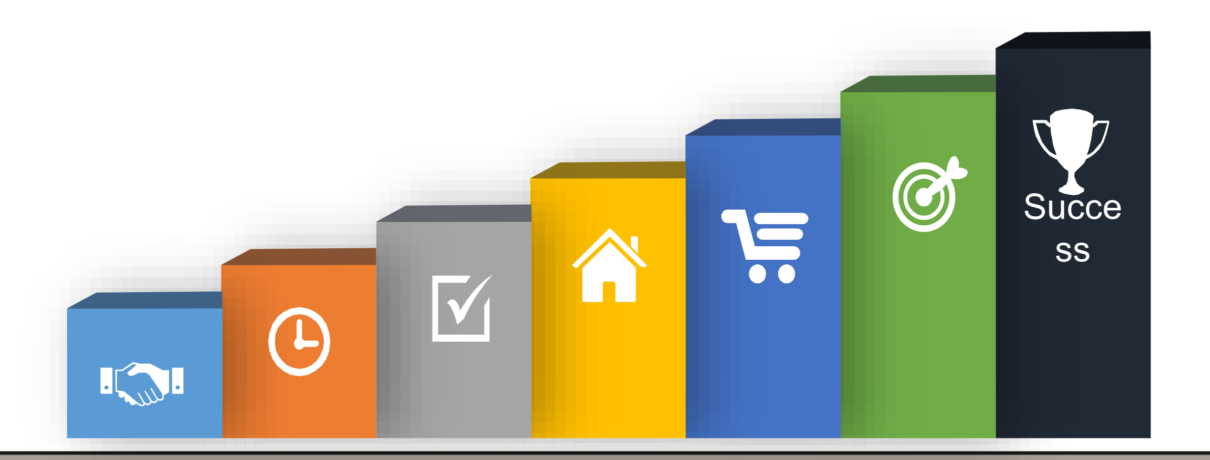
Presented by :
Abdulfattah Ajlan
Certified PMP Trainer

The Project Manager Competency



Project manager:

Is the person assigned by the performing organization to **lead** the team responsible for achieving the project objectives.

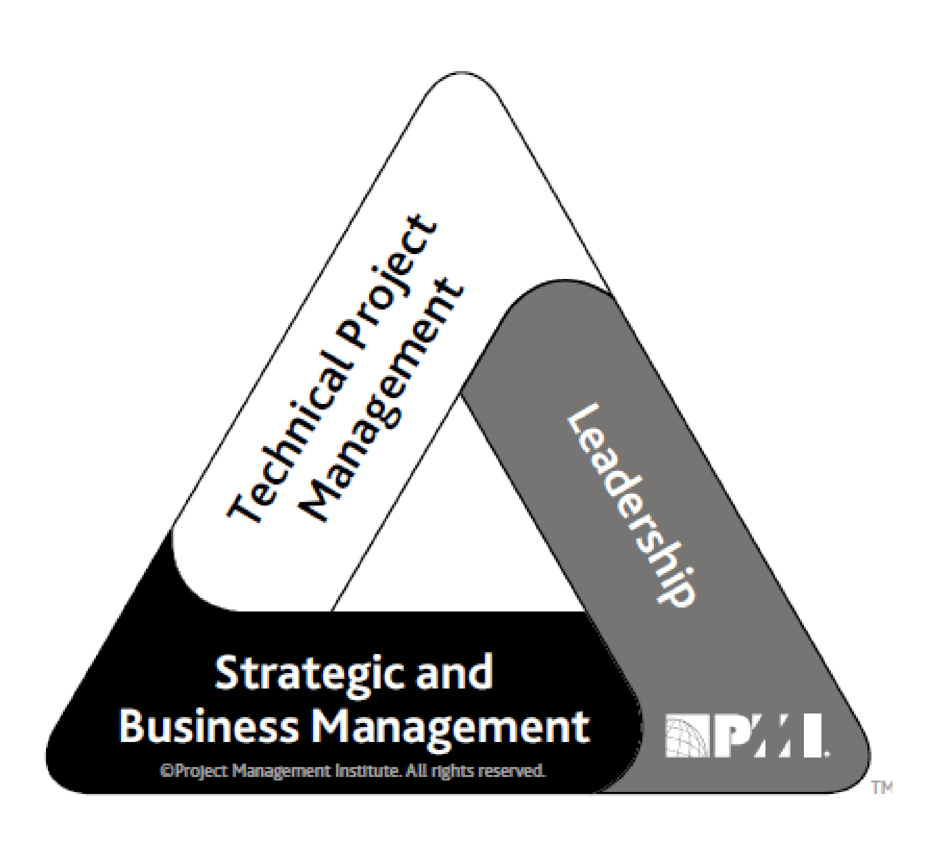


The Project Manager Competency



PMI studies applied the Project Manager Competency Development (PMCD) Framework to the skills needed by project managers through the use of The PMI Talent Triangle.





Technical project management.
The knowledge, skills, and behaviors related to specific domains of project, program, and portfolio management.

Strategic and business management.
The knowledge of and expertise in the industry and organization that enhanced performance and better delivers business outcomes.

Leadership
The knowledge, skills, and behaviors needed to guide, motivate, and direct a team, to help an organization achieve its business goals.

The Project Manager Competency





Leadership skills involve the ability to guide, motivate, and direct a team. include essential capabilities such as negotiation, resilience, communication, problem solving, critical thinking, and interpersonal skills.

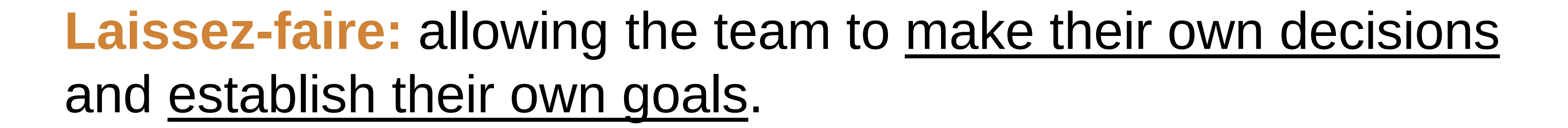
Dealing with people

A project manager applies leadership skills and qualities when working with all project stakeholders, including the project team, the steering team, and project sponsors.



Leadership styles





Laissez-faire: allowing the team to make their own decisions and establish their own goals.

Transactional: focus on goals, feedback, and accomplishment to determine rewards; management by exception.

Servant leader: demonstrates commitment to serve and put other people first; focuses on other people's growth, learning, development, autonomy, and well-being; concentrates on relationships, community and collaboration.

Project

Manager

Leadership styles



Project



Manager

Transformational: empowering followers through idealized attributes and behaviors, inspirational motivation, encouragement for innovation and creativity, and individual consideration.

Charismatic: able to inspire; is high-energy, enthusiastic, self-confident; holds strong convictions.

Interactional: a combination of transactional, transformational, and charismatic.

Manager vs Leader



Project managers need to employ both leadership and management in order to be successful.

Management	Leadership
1. Direct using positional power 2. Maintain 3. Administrate 4. Focus on systems and structure 5. Rely on control 6. Focus on near-term goals 7. Ask how and when 8. Focus on bottom line 9. Accept status quo **10. Do things right** 11. Focus on operational issues and problem solving	1. Guide, influence, and collaborate using relational power 2. Develop 3. Innovate 4. Focus on relationships with people 5. Inspire trust 6. Focus on long-range vision 7. Ask what and why 8. Focus on the horizon 9. Challenge status quo **10. Do the right things** 11. Focus on vision, alignment, motivation, and inspiration

Perform Integration

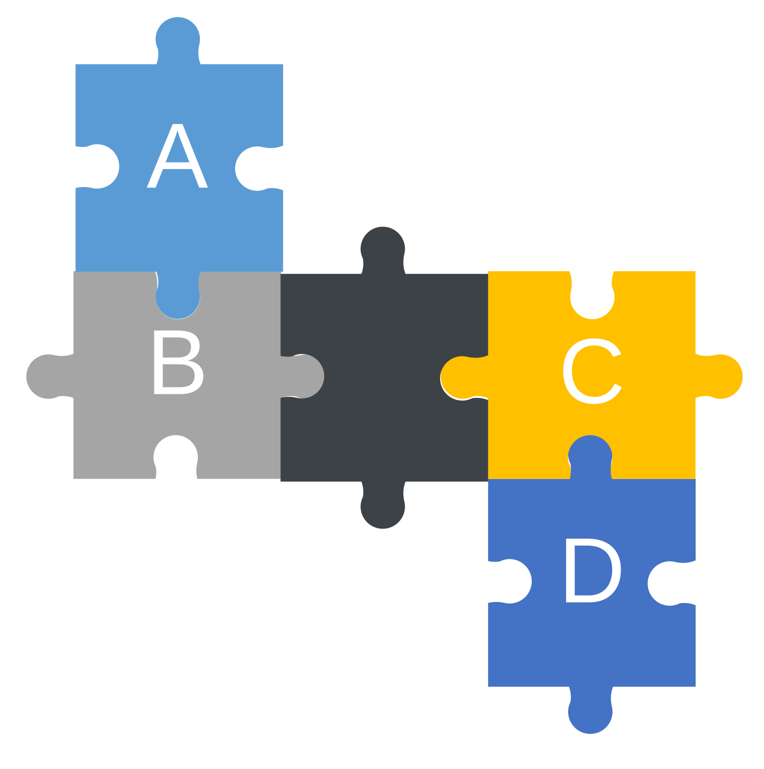




Integration is a critical skill for project managers.

Integration and execution of the strategy.

When working with the project sponsor to understand the strategic objectives and ensure the alignment of the project objectives and results with those of the portfolio, program, and business areas.



Integration of processes, knowledge, and people.

By guiding the team to work together to focus on what is really essential at the project level.



4. PROJECT INTEGRATION MANAGEMENT



Presented by :

Abdulfattah Ajlan

Certified PMP Trainer



Project Integration Management

Includes the processes and activities to identify, define, combine, unify, and coordinate the various processes and project management activities within the Project Management Process Groups.

Includes making choices about:

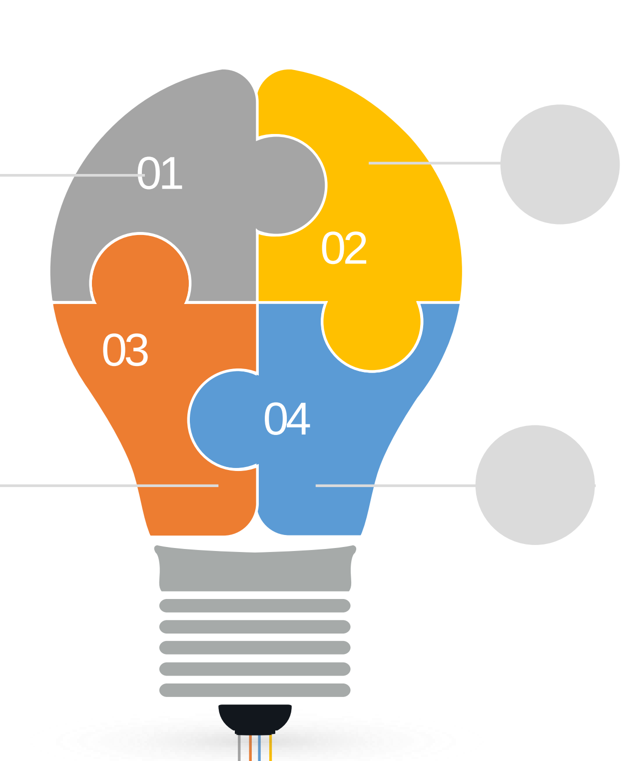
- Resource allocation.
- Balancing competing demands.
- Examining any alternative approaches.
- Tailoring the processes to meet objectives.
- Managing the interdependencies among the Project Management Knowledge Areas





Key concepts for Project Integration Management

Project Integration Management it is the specific responsibility of the project manager and it cannot be delegated or transferred.



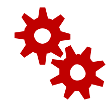
Projects and project management are integrative by nature

Project manager combines the results from all the other Knowledge Areas to provide an overall view of the project.

.

The project manager is ultimately responsible for the project as a whole

Knowledge Areas	Project Management Process Groups				
	Initiating	Planning	Executing	Monitoring and Controlling	Closing
Project Integration Management	4.1 Develop Project Charter	4.2 Develop Project Management Plan	4.3 Direct and Manage Project Work 4.4 Manage Project Knowledge	4.5 Monitor and Control Project Work 4.6 Perform Integrated Change Control	4.7 Close Project
Project Scope Management		5.1 Plan Scope Management 5.2 Collect Requirements 5.3 Define Scope 5.4 Create WBS		5.5 Validate Scope 5.6 Control Scope	
Project Schedule Management		6.1 Plan Schedule Management 6.2 Define Activities 6.3 Sequence Activities 6.4 Estimate Activity Durations 6.5 Develop Schedule Management		6.6 Control Schedule	
Project Cost Management		7.1 Plan Cost Management 7.2 Estimate Costs 7.3 Determine Budge		7.4 Control Costs	
Project Quality Management		8.1 Plan Quality Management	8.2 Manage Quality	8.3 Control Quality	
Project Resource Management		9.1 Plan Resource Management 9.2 Estimate Activity Resources	9.3 Acquire Resources 9.4 Develop Team 9.5 Manage Team	9.6 Control Resources	
Project Communications Management		10.1 Plan Communications Management	10.2 Manage Communications	10.3 Monitor Communications	
Project Risk Management		11.1 Plan Risk Management 11.2 Identify Risks 11.3 Perform Qualitative Risk Analysis 11.4 Perform Quantitative Risk Analysis 11.5 Plan Risk Responses	11.6 Implement Risk Responses	11.7 Monitor Risks	
Project Procurement Management		12.1 Plan Procurement Management	12.2 Conduct Procurements	12.3 Control Procurements	
Project Stakeholder Management	13.1 Identify Stakeholders	13.2 Plan Stakeholder Engagement	13.3 Manage Stakeholder Engagement	13.4 Monitor Stakeholder Engagement	



4.1 Develop Project Charter

Legend:
New Item
Already Explained Item



Inputs, Tools & Techniques, and Outputs

Inputs		Tools & Techniques		Outputs	
Business documents (Business case)	6	Expert judgment	35	Project charter	1
~~Business documents (Benefits management plan)~~	~~5~~	Data gathering (Brainstorming)	6	Assumption log	1
Agreements	11	Data gathering (Focus groups)	3		
Enterprise environmental factors	40	Data gathering (Interviews)	8		
Organizational process assets	47	Interpersonal and team skills (Conflict management)	6		
		Interpersonal and team skills (Facilitation)	9		
		Interpersonal and team skills (Meeting management)	3		
		Meetings	28		





4.1 Develop Project Charter



Data Flow Diagrams

Business Documents

Business documents
- Business case

- Agreements

Enterprise/ Organization

- Enterprise environmental factors
- Organizational process assets

4.1 Develop Project Charter

- Assumption log

Project Documents

- Project charter

4.2 Develop Project Management Plan

4.7 Close Project or Phase

5.1 Plan Scope Management

5.2 Collect Requirements

5.3 Define Scope

6.1 Plan Schedule Management

7.1 Plan Cost Management

8.1 Plan Quality Management

9.1 Plan Resource Management

10.1 Plan Communications Management

11.1 Plan Risk Management

12.1 Plan Procurement Management

13.1 Identify Stakeholders

13.2 Plan Stakeholder Engagement







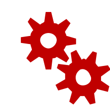
PMP Tools, Techniques, and Skills Groups (6)

Communication skills (4)	Decision making (4)	Data gathering (9)	Data representation (15)	Interpersonal and team skills (17)	Data analysis (28)
- Communication competence	- Autocratic Decision making	- Benchmarking	- Affinity diagrams	- Active listening	- Alternatives analysis
- Feedback	- Multicriteria decision analysis	- Brainstorming	- Cause-and-effect diagrams	- Communication styles assessment	- Assessment of other risk parameters
- Nonverbal	- Prioritization/ranking	- Check sheets	- Control charts	- Conflict management	- Assumption and constraint analysis
- Presentations	- Voting	- Checklists	- Flowcharts	- Cultural awareness	- Cost of quality
		- Focus groups	- Hierarchical charts	- Decision making	- Cost-benefit analysis
		- Interviews	- Histograms	- Emotional intelligence	- Decision tree analysis
		- Market research	- Logical data model	- Facilitation	- Document analysis
		- Questionnaires and surveys	- Matrix diagrams	- Influencing	- Earned value analysis
		- Statistical sampling	- Mind mapping	- Leadership	- Influence diagrams
			- Probability and impact matrix	- Meeting management	- Iteration burndown chart
			- Responsibility assignment matrix	- Motivation	- Make-or-buy analysis
			- Scatter diagrams	- Negotiation	- Performance reviews
			- Stakeholder engagement assessment matrix	- Networking	- Process analysis
			- Stakeholder mapping/representation	- Nominal group technique	- Proposal evaluation
			- Text-oriented formats	- Observation/conversation	- Regression analysis
				- Political awareness	- Reserve analysis
				- Team building	- Risk data quality assessment
					- Risk probability and impact assessment
					- Root cause analysis
					- Sensitivity analysis
					- Simulation
					- Stakeholder analysis
					- Stakeholder engagement assessment matrix
					- SWOT analysis
					- Technical performance analysis
					- Trend analysis
					- Variance analysis
					- What-if scenario analysis

Count of Use

Group	Count
Communication skills	7
Decision making	15
Data gathering	30
Data representation	26
Interpersonal and team skills	54
Data analysis	77

0 10 20 30 40 50 60 70 80



4.1 Develop Project Charter Input



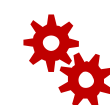
01 **Business documents** (Business case)

02 **Agreements**

- They are used to define **initial intentions** for a project.
- **Agreements May take the form of** contracts, memorandums of understanding (MOUs), service level agreements (SLA), letters of acceptance, letters of intent, verbal agreements, email, or other written agreements.
- A contract is used when a project is being performed for an external customer.

03 **Enterprise Environmental Factor**

04 **Organization Process Asset**



4.1 Develop Project Charter Tools & Techniques



01 Expert judgment

- Defined as judgment provided based upon expertise in an application area, Knowledge Area, discipline, industry, etc., as appropriate for the activity being performed.
- Such expertise may be provided by any group or person with specialized education, knowledge, skill, experience, or training.

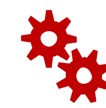
02 Data Gathering

Brainstorming

- Is used to identify a list of ideas in a short period of time.
- It is conducted in a group environment and is led by a facilitator.
- Brainstorming comprises **two** parts: **idea generation** and **analysis**.







4.1 Develop Project Charter Tools & Techniques

02 Data Gathering

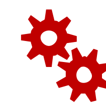
Focus group

- Bring together **stakeholders** and **subject matter experts** to learn about the perceived project risk, success criteria, and other topics in a more conversational way than a one-on-one interview.

Interviews

- Are used to obtain information on high-level requirements, assumptions or constraints, approval criteria, and other information from stakeholders by talking directly to them.





4.1 Develop Project Charter Tools & Techniques



03

Interpersonal and team skills

Conflict management

- Can be used to help **bring stakeholders into alignment** on the objectives, success criteria, high-level requirements, project description, summary milestones, and other elements of the charter.

Facilitation

- The ability to effectively **guide a group event** to a successful decision.
- A **facilitator** ensures that there is effective participation, that participants achieve a mutual understanding, that all contributions are considered, that conclusions or results have full buy-in.

Meeting management

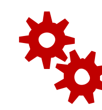
- Includes preparing the agenda, ensuring that a representative for each key stakeholder group is invited, and preparing and sending the follow-up minutes and actions.

04

Meetings

Meetings are held with key stakeholders to identify the project objectives, success criteria, key deliverables, high-level requirements, and other summary information.





4.1 Develop Project Charter Output

01 Project Charter

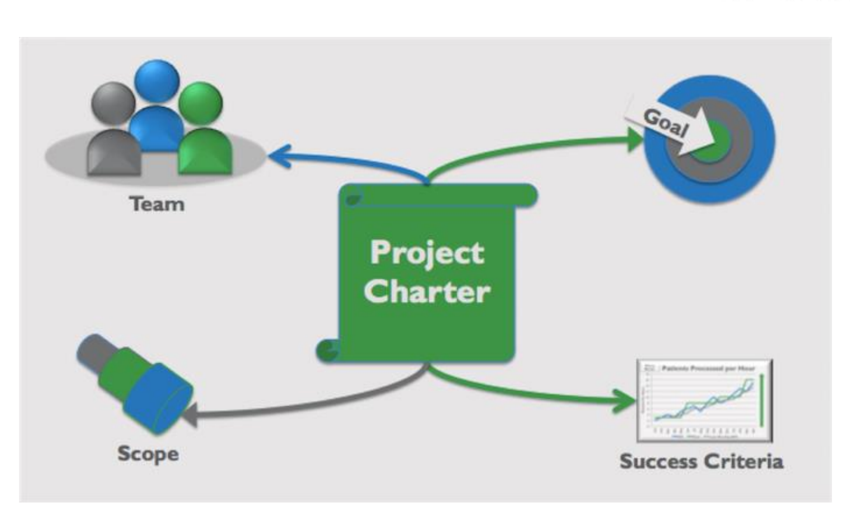
- The project charter is the document issued by the project initiator or sponsor that formally authorizes the existence of a project and provides the project manager with the authority to apply organizational resources to project activities

02 Assumption Log

- High-level strategic and operational assumptions and constraints.
- Lower-level activity and task assumptions (technical specifications, estimates, the schedule, risks)
- The assumption log is used to record all assumptions and constraints throughout the project life cycle.

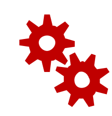


Project Charter



Project charter documents the high-level information on the project such as:

- Project purpose;
- High-level requirements;
- Measurable project objectives and related success criteria;
- Overall project risk;
- Summary milestone schedule;
- Preapproved financial resources;
- Key stakeholder list;
- Assigned project manager, responsibility, and authority level
- Name and authority of the sponsor or other person(s) authorizing the project charter.



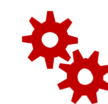
4.2 Develop Project Management Plan

Legend:
New Item
Already Explained Item



Inputs, Tools & Techniques, and Outputs

Inputs		Tools & Techniques		Outputs	
Project charter	14	Expert judgment	35	Project management plan	1
Outputs from other processes	1	Data gathering (Brainstorming)	6		
Enterprise environmental factors	40	Data gathering (Checklists)	4		
Organizational process assets	47	Data gathering (Focus groups)	3		
		Data gathering (Interviews)	8		
		Interpersonal and team skills (Conflict management)	6		
		Interpersonal and team skills (Facilitation)	9		
		Interpersonal and team skills (Meeting management)	3		
		Meetings	28		



4.2 Develop Project Management Plan



Data Flow Diagrams

4.1 Develop Project Charter
• Project charter

Outputs from Other Processes
• Any baseline or component plan

Enterprise/ Organization
• Enterprise environmental factors
• Organizational process assets

4.2 Develop Project Management Plan
• Project management plan

Project Management Plan



4.2 Develop Project Management Plan Input

01 **Project charter**

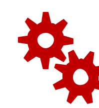
02 **Outputs from other processes**

- Subsidiary plans
- All baselines

03 **Enterprise Environmental Factor**

04 **Organization Process Asset**





4.2 Develop Project Management Plan Tools & Techniques



01 **Expert judgment**

02 **Data gathering**

- Brainstorming
- Focus group
- Interviews
- **Checklists**: A checklist may guide the project manager to develop the plan or may help to verify that all the required information is included in the project management plan.

03 **Interpersonal and team skills**

- Conflict management
- Facilitation
- Meeting management

04 **Meetings**

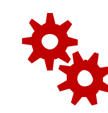


Checklists Example:



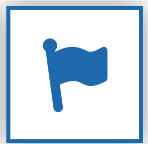
1.	**Checklist for Project Management Processes**	
	Review all sections	
	Project Sponsor	☐
	Project Manager	☐
	Trained Team	☐
	Develop Program Directive	☐
	Program Directive approved	☐
	Develop Project Management Implementation Plan	☐
	Project Management Implementation Plan approved	☐
	Obtain commitment of all stakeholders	☐
	Develop a Risk Management Plan	☐
	Decide Life Cycle approach	☐
	Develop Work Breakdown Structures	☐
	Develop a schedule. Identify:	☐
	Activities	☐
	Logic	☐
	Resources	☐
	Risk	☐
	Estimates	☐
	Establish a baseline Schedule	☐
	Develop a Quality Assurance Plan to meet project specs	☐
	Track and monitor Implementation Plan	☐
	Conduct formal and informal reviews	☐





4.2 Develop Project Management Plan Output

01 **Project Management Plan** is the document that describes how the project will be executed, monitored and controlled, and closed. It integrates and consolidates all of the subsidiary management plans and baselines, and other information necessary to manage the project.



Project baselines:

- Scope baseline.
- Schedule baseline.
- Cost baseline.



Additional components as:

- Change management plan
- Configuration management plan
- Management reviews



Subsidiary plans as:

Scope management plan, Schedule management plan, Etc.



Progressive Elaboration



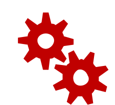
Project Management Plan

1. Scope management plan
2. Requirements management plan
3. Schedule management plan
4. Cost management plan
5. Quality management plan
6. Resource management plan
7. Communications management plan
8. Risk management plan
9. Procurement management plan
10. Stakeholder engagement plan
11. Scope baseline
12. Schedule baseline
13. Cost baseline
14. Change management plan
15. Configuration management plan
16. Performance measurement baseline.
17. Project life cycle description
18. Development approach
19. Management Review

Project Documents

1. Activity attributes
2. Activity list
3. Assumption log
4. Basis of estimates
5. Change log
6. Cost estimates
7. Cost forecasts
8. Duration estimates
9. Issue log
10. Lessons learned register
11. Milestone list
12. Physical resource assignments
13. Project calendars
14. Project communications
15. Project schedule
16. Project schedule network diagram
17. Project scope statement
18. Project team assignments
19. Quality control measurements
20. Quality metrics
21. Quality report
22. Requirements documentation
23. Requirements traceability matrix
24. Resource breakdown structure
25. Resource calendars
26. Resource requirements
27. Risk register
28. Risk report
29. Schedule data
30. Schedule forecasts
31. Stakeholder register
32. Team charter
33. Test and evaluation documents





4.3 Direct and Manage Project Work

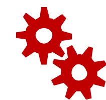


Legend:
New Item
Already Explained Item



Inputs, Tools & Techniques, and Outputs

Inputs		Tools & Techniques		Outputs	
Project management plan (Any component)	2	Expert judgment	35	Deliverables	1
Project documents (Change log)	6	Project management information system (PMIS)	12	Work performance data	1
Project documents (Lessons learned register)	27	Meetings	28	Issue log	1
Project documents (Milestone list)	9			Change requests	24
Project documents (Project communications)	4			Project management plan updates (Any component)	5
Project documents (Project schedule)	11			Project documents updates (Activity list)	2
Project documents (Requirements traceability matrix)	7			Project documents updates (Assumption log)	17
Project documents (Risk register)	22			Project documents updates (Lessons learned register)	29
Project documents (Risk report)	10			Project documents updates (Requirements documentation)	7
Approved change requests	3			Project documents updates (Risk register)	23
Enterprise environmental factors	40			Project documents updates (Stakeholder register)	12
Organizational process assets	47			Organizational process assets updates	10



4.3 Direct and Manage Project Work



Data Flow Diagrams

Project Management Plan

Project management plan
- Any component

Project Documents

Project documents
- Change log
- Lessons learned register
- Milestone list
- Project communications
- Project schedule
- Requirements traceability matrix
- Risk register
- Risk report

4.6 Perform Integrated Change Control

- Approved change requests

Enterprise/ Organization

- Enterprise environmental factors
- Organizational process assets

4.3 Direct and Manage Project Work

- Deliverables

4.4 Manage Project Knowledge

- Change requests
- Deliverables

4.6 Perform Integrated Change Control

- Deliverables

8.3 Control Quality

Project management plan updates
- Any component

Project Management Plan

- Issue log

Project Documents

Project documents updates
- Activity list
- Assumption log
- Lessons learned register
- Requirements documentation
- Risk register
- Stakeholder register

Enterprise/ Organization

- Organizational process assets updates

- Work performance data

5.5. Validate Scope

5.6 Control Scope

6.6 Control Scehdule

7.4 Control Costs

8.3 Control Quality

9.6 Control Resources

10.3 Monitor Communications

11.7 Monitor Risks

12.3 Control Procurements

13.4 Monitor Stakeholder Engagementt



4.3 Direct and Manage Project Work Input

01 **Project management plan**

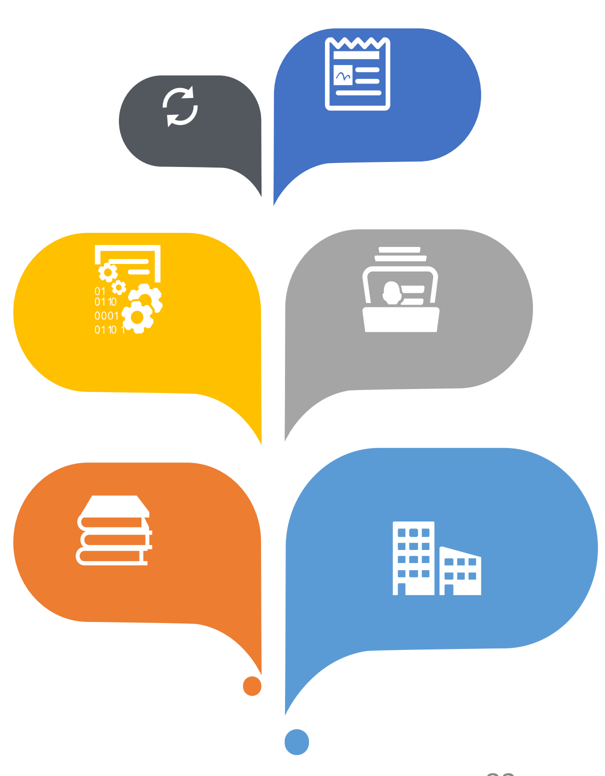
02 **Project documents**

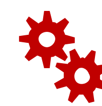
- Change log
- Lessons learned register
- Milestone list
- Project communications
- Project schedule
- Requirements traceability matrix
- Risk register
- Risk report

03 **Approved change requests** an output of the Perform Integrated Change Control process,

04 **EEFs.**

05 **OPA.**





4.3 Direct and Manage Project Work   Tools & Techniques



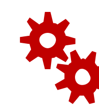
01 **Expert judgment**

02 **Project Management Information System (PMIS)**

Is part of the environmental factors, provides access to tools : scheduling tool - configuration management system - information collection and distribution system - Interfaces to other online automated systems.

03 **Meetings**

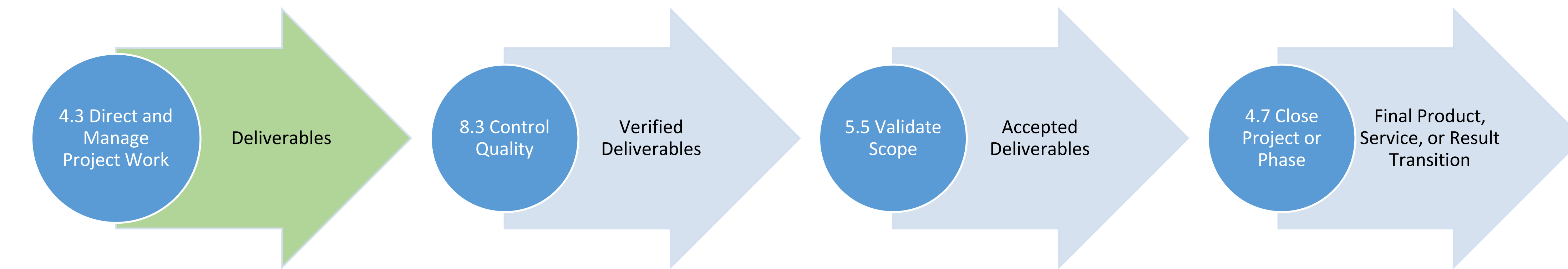




4.3 Direct and Manage Project Work   Output

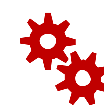


01 **Deliverable:** deliverable is any unique and verifiable product, result, or capability to perform a service that is required to be produced to complete a process, phase, or project.



02 **Work performance data**: are the raw observations and measurements identified during activities being performed to carry out the project work. Such as (% of exact activity)

03 **Issue log**: is a project document where all the issues are recorded and tracked.





4.3 Direct and Manage Project Work Output

04 **Change Requests**

- **Corrective action.** An intentional activity that realigns the performance of the project work with the project management plan.
- **Preventive action.** An intentional activity that ensures the future performance of the project work is aligned with the plan.
- **Defect repair.** An intentional activity to modify a nonconforming product or product component.
- **Updates.** Changes to formally controlled project documents, plans, etc., to reflect modified or additional ideas or content.

05 **Project management plan updates**

06 **Project document updates**

07 **Organizational process assets updates**



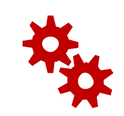


4.4 Manage Project Knowledge

Manage Project Knowledge the process of using existing knowledge and creating new knowledge to achieve the project's objectives and contribute to organizational learning.

The Key Benefit are that prior organizational knowledge is leveraged to produce or improve the project outcomes, and make the knowledge created by the project available to support organizational operations and future projects or phases.





4.4 Manage Project Knowledge

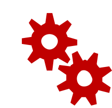
Legend:
New Item
Already Explained Item



Inputs, Tools & Techniques, and Outputs

Inputs		Tools & Techniques		Outputs	
Project management plan (All components)	3	Expert judgment	35	Lessons learned register	1
Project documents (Lessons learned register)	27	Knowledge management	1	Project management plan updates (Any component)	5
Project documents (Project team assignments)	7	Information management	1	Organizational process assets updates	10
Project documents (Resource breakdown structure)	3	Interpersonal and team skills (Active listening)	3		
~~Project documents (Source selection criteria)~~	1	Interpersonal and team skills (Facilitation)	9		
Project documents (Stakeholder register)	17	Interpersonal and team skills (Leadership)	3		
Deliverables	2	Interpersonal and team skills (Networking)	3		
Enterprise environmental factors	40	Interpersonal and team skills (Political awareness)	5		
Organizational process assets	47				





4.4 Manage Project Knowledge



Data Flow Diagrams

Inputs:

Project Management Plan
Project management plan
- All components

Project Documents
Project documents
- Lessons learned register
- Project team assignments
- Resource breakdown structure
- ~~Source selection criteria~~
- Stakeholder register

4.3 Direct and Manage Project Work
- Deliverables

Enterprise/ Organization
- Enterprise environmental factors
- Organizational process assets

Process: 4.4 Manage Project Knowledge

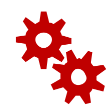
Outputs:

Project Management Plan
Project management plan updates
- Any component

Project Documents
- Lessons learned register

Enterprise/ Organization
- Organizational process assets updates





4.4 Manage Project Knowledge   Input



01 **Project management plan.**

02 **Project documents.**

- Lessons learned register
- Project team assignments
- Resource breakdown structure
- ~~Source selection criteria~~
- Stakeholder register



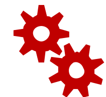
03 **Deliverables.**

Deliverable is any unique and verifiable product, result, or capability to perform a service that is required to be produced to complete a process, phase, or project.

04 **EEFs.**

05 **OPA.**





4.4 Manage Project Knowledge Tools & Techniques



01 **Expert judgment**

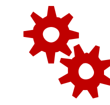
2 **Knowledge management** using existing knowledge and connect people so they can work together to create new knowledge.

3 **Information management** tools and techniques used to connect people to information.

4 **Interpersonal and team skills**

- **Active listening.** helps reduce misunderstandings and improves communication and knowledge sharing.
- **Facilitation.**
- **Leadership**.
- **Networking**.
  Allows informal connections and relations among project stakeholders to be established and creates the conditions to share tacit and explicit knowledge.
- **Political awareness.**
  Helps the project manager to plan communications based on the project environment as well as the organization's political environment.





4.4 Manage Project Knowledge Output

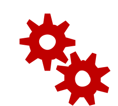
01 Lessons learned register

- The category and description **of the situation**
- The impact, recommendations, and proposed actions **associated with the situation**.
- Record challenges, problems, realized risks and opportunities, or other content as appropriate.

02 Project management plan updates

03 OPA updates

Lessons Learned Log							
Project				Project Manager			
Management/ Quality Process Name	Success of process? Went Well/Badly/Lacking	Description of any Abnormal event causing deviation	Performance of Specialist methods/tools: Notes	Project Management Method – Recommendations for future modification	Effort measures for creating products	Effectiveness of Tests/Quality Reviews	Reasons for them working well or badly



4.5 Monitor and Control Project Work

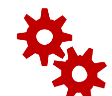
Legend:
New Item
Already Explained Item



Inputs, Tools & Techniques, and Outputs

Inputs		Tools & Techniques		Outputs	
PM Plan (Any component)	2	Expert judgment	35	Work performance reports	1
Project documents (Assumption log)	14	Data analysis (Alternatives analysis)	13	Change requests	24
Project documents (Basis of estimates)	6	Data analysis (Cost-benefit analysis)	5	PM Plan updates (Any component)	5
Project documents (Cost forecasts)	2	Data analysis (Earned value analysis)	4	Project documents updates (Cost forecasts)	2
Project documents (Issue log)	12	Data analysis (Root cause analysis)	6	Project documents updates (Issue log)	14
Project documents (Lessons learned register)	27	Data analysis (Trend analysis)	7	Project documents updates (Lessons learned register)	29
Project documents (Milestone list)	9	Data analysis (Variance analysis)	5	Project documents updates (Risk register)	23
Project documents (Quality reports)	5	Decision making (Voting)	7	Project documents updates (Schedule forecasts)	1
Project documents (Risk register)	22	Meetings	28		
Project documents (Risk report)	10				
Project documents (Schedule forecasts)	2				
Work performance information	1				
Agreements	11				
Enterprise environmental factors	40				
Organizational process assets	47				

CORRECTION



4.5 Monitor and Control Project Work



Data Flow Diagrams

Project Management Plan

Project management plan
- Any component

Project Documents

Project documents
- Assumption log
- Basis of estimates
- Cost forecasts
- Issue log
- Lessons learned register
- Milestone list
- Quality reports
- Risk register
- Risk report
- Schedule forecasts

12.2 Conduct Procurements

- Agreements

4.5 Monitor and Control Project Work

4.6 Perform Integrated Change Control

- Change requests
- Work performance reports

9.5 Manage Team

- Work performance reports

10.2 Manage Communications

- Work performance reports

11.7 Monitor Risks

- Work performance reports

Project Management Plan

Project management plan updates
- Any component

Project Documents

Project documents updates
- Cost forecasts
- Issue log
- Lessons learned register
- Risk register
- Schedule forecasts

Enterprise/ Organization

- Enterprise environmental factors
- Organizational process assets

- Work performance information

5.5 Validate Scope

5.6. Control Scope

6.6 Control Schedule

7.4 Control Costs

8.3 Control Quality

9.6 Control Resources

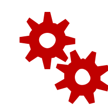
10.3 Monitor Communications

11.7 Monitor Risks

12.3 Control Procurements

13.4 Monitor Stakeholder Engagement





4.5 Monitor and Control Project Work Input

01 **Project management plan**

02 **Project documents**

- Assumption log
- Basis of estimates
- Cost forecasts
- Issue log
- Lessons learned register
- Milestone list
- Quality reports
- Risk register
- Risk report
- Schedule forecasts

03 **Work performance information**

- It is gathered through work execution and passed to the controlling processes.
- To become work performance information, the work performance data are compared with the project management plan components, project documents, and other project variables.

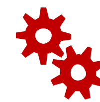
04 **Agreements**



05 **EEF**



06 **OPA**



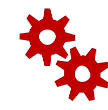
4.5 Monitor and Control Project Work Tools & Techniques



01 **Expert judgment**

02 **Data analysis**

- **Alternatives analysis**. is used to select the corrective actions or a combination of corrective and preventive actions to implement when a deviation occurs.
- **Cost-benefit analysis**. helps to determine the best corrective action in terms of cost in case of project deviations.
- **Earned value analysis.** provides an integrated perspective on scope, schedule, and cost performance (Cost Management).
- **Root cause analysis (Cause & Effect) (Fish bone diagram) :** focuses on identifying the main reasons of a problem. It can be used to identify the reasons for a deviation and the areas the project manager should focus on in order to achieve the objectives of the project.



4.5 Monitor and Control Project Work Tools & Techniques



02 Data analysis

- **Trend analysis.**

✓ It is used to forecast future performance based on past results.

✓ It looks ahead in the project for expected slippages and warns the project manager ahead of time that there may be problems later in the schedule if established trends persist.

✓ This information is made available early enough in the project timeline to give the project team time to analyze and correct any anomalies.

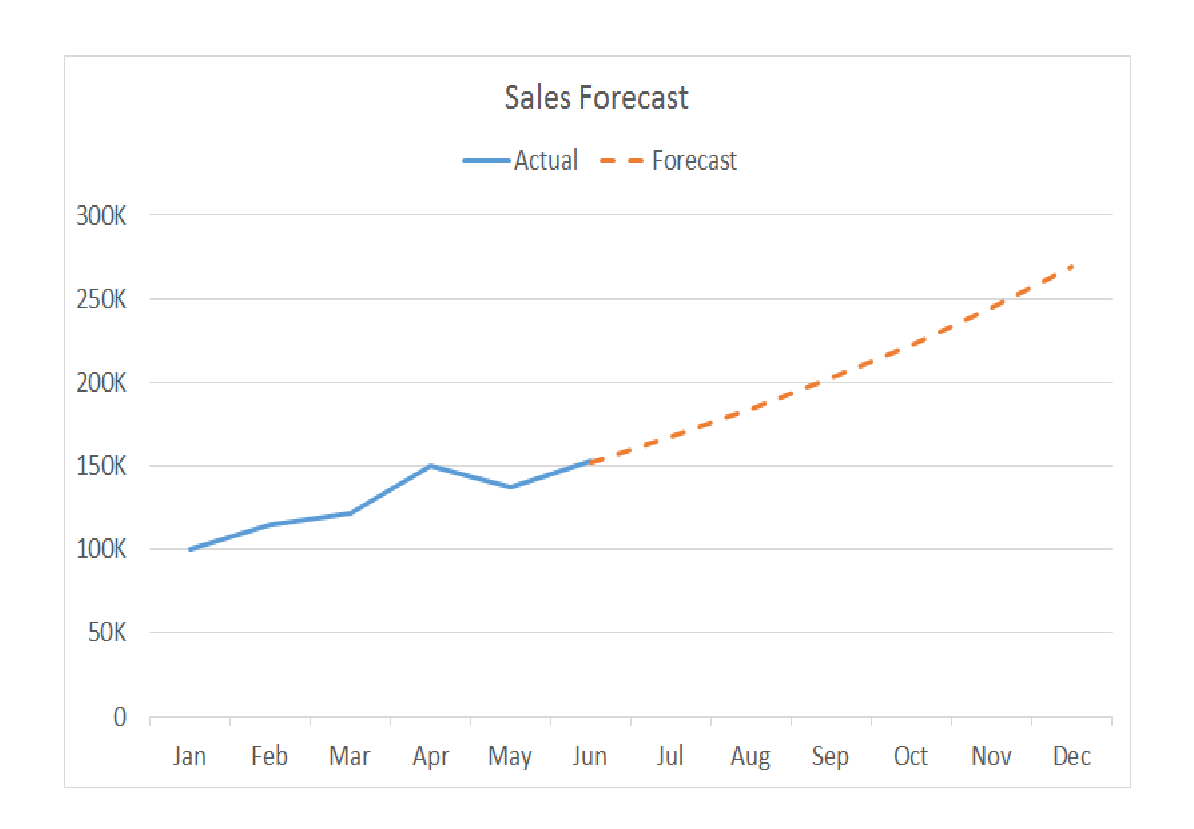
✓ The results of trend analysis can be used to recommend preventive actions if necessary.



Root cause analysis

Materials
Methods
Measurements
Problem
Machines
Environment
Personnel
Cause
Effect

Trend analysis





4.5 Monitor and Control Project Work Tools & Techniques

02 Data analysis

Variance analysis.

Reviews the differences (or variance) between planned and actual performance. This can include duration estimates, cost estimates, resources utilization, resources rates, technical performance, and other metrics.

03 Decision making

Voting.

- Voting can take the form of **unanimity, majority, or plurality**

04 Meetings



4.5 Monitor and Control Project Work Output

01 **Work performance reports:**

are the physical or electronic representation of work performance information intended to generate decisions, actions, or awareness.

02 **Change requests**

03 **Project management plan updates**

04 **Project documents updates**

- Cost forecasts
- Issue log
- Lessons learned register
- Risk register
- Schedule forecasts





Work performance reports

Process

4.3 Direct and Manage Project Work

→ Work Performance Data →

Processes

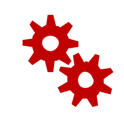
5.5 Validate Scope
5.6 Control Scope
6.6 Control Schedule
7.4 Control Costs
8.3 Control Quality
9.6 Control Resources
10.3 Monitor Communications
11.7 Monitor Risks
12.3 Control Procurements
13.4 Monitor Stakeholder Engagement

→ Work Performance Information →

Process

4.5 Monitor and Control Project Work

→ Work Performance Reports



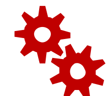
4.6 Perform Integrated Change Control

Legend:
New Item
Already Explained Item



Inputs, Tools & Techniques, and Outputs

Inputs		Tools & Techniques		Outputs	
Project management plan (Change management plan)	4	Expert judgment	35	Approved change requests	1
Project management plan (Configuration management plan)	3	Change control tools	1	Project management plan updates (Any component)	5
Project management plan (Scope baseline)	16	Data analysis (Alternatives analysis)	13	Project documents updates (Change log)	2
Project management plan (Schedule baseline)	5	Data analysis (Cost-benefit analysis)	5		
Project management plan (Cost baseline)	7	Decision making (Voting)	7		
Project documents (Basis of estimates)	6	Decision making (Autocratic decision making)	2		
Project documents (Requirements traceability matrix)	7	Decision making (Multicriteria decision analysis)	8		
Project documents (Risk report)	10	Meetings	28		
Work performance reports	4				
Change requests	1				
Enterprise environmental factors	40				
Organizational process assets	47				



4.6 Perform Integrated Change Control



Data Flow Diagrams

Project Management Plan

Project management plan
- Change management plan
- Configuration management plan
- Scope baseline
- Schedule baseline
- Cost baseline

Project Documents

Project documents
- Basis of estimates
- Requirements traceability matrix
- Risk report

4.5 Monitor and Control Project Work

- Work performance reports
- Change requests

Enterprise/ Organization

- Enterprise environmental factors
- Organizational process assets

4.6 Perform Integrated Change Control

4.3 Direct and Manage Project Work

- Approved change requests

8.3 Control Quality

- Approved change requests

12.3 Control Procurements

- Approved change requests

Project Management Plan

Project management plan updates
- Any component

Project Documents

Project documents updates
- Change log

- Change requests

4.3 Direct and Manage Project Work

5.5 Validate Scope

5.6. Control Scope

6.2 Define Activities

6.6 Control Schedule

7.4. Control Costs

8.2 Manage Quality

8.3 Control Quality

9.3 Acquire Resources

9.4 Develop Team

9.5 Manage Team

9.6 Control Resources

10.3 Monitor Communications

11.5 Plan Risk Responses

11.6 Implement Risk Responses

11.7 Monitor Risks

12.1 Plan Procurement Management

12.2 Conduct Procurements

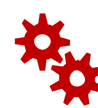
12.3 Control Procurements

13.1 Identify Stakeholders

13.3 Manage Stakeholder Engagement

13.4 Monitor Stakeholder Engagement





4.6 Perform Integrated Change Control Input

01 **Project management plan**

02 **Project documents.**

03 **Work performance reports.**

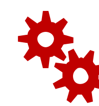
Reports of particular interest to the Perform Integrated Change Control process include resource availability, schedule and cost data, earned value reports, and burn-up or burn-down charts.

04 **Change requests.** result of comparing planned results to actual results (Corrective action, Preventive action, Defect repair).

05 **EEF.**

06 **OPA.**





4.6 Perform Integrated Change Control Tools & Techniques



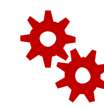
01 **EXPERT JUDGMENT**

In addition to the project management team's expert judgment, stakeholders may be asked to provide their expertise and maybe asked to sit on **the change control board (CCB)**.

02 **CHANGE CONTROL TOOLS**

Tools are used to manage the change requests and the resulting decisions. It include:

- Identify changes.
- Document changes.
- Approve or reject changes.
- Track changes



4.6 Perform Integrated Change Control Tools & Techniques



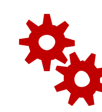
03 **DATA ANALYSIS**

- Alternatives analysis.
- Cost-benefit analysis.

04 **DECISION MAKING**

- **Voting.**
  - Voting can take the form of **unanimity, majority, or plurality** to decide on whether to accept, defer, or reject change requests.
- **Autocratic decision making.**
  - One individual takes the responsibility for making the decision for the entire group.
- **Multi-criteria decision analysis.**
  - This technique uses a decision matrix to provide a systematic analytical approach to evaluate the requested changes according to a set of predefined criteria.

05 **MEETINGS**



4.6 Perform Integrated Change Control Output



01

APPROVED CHANGE REQUESTS

- Approved change requests will be implemented through the Direct and Manage Project Work process.
- All change requests are recorded in the change log as a project document update.

02

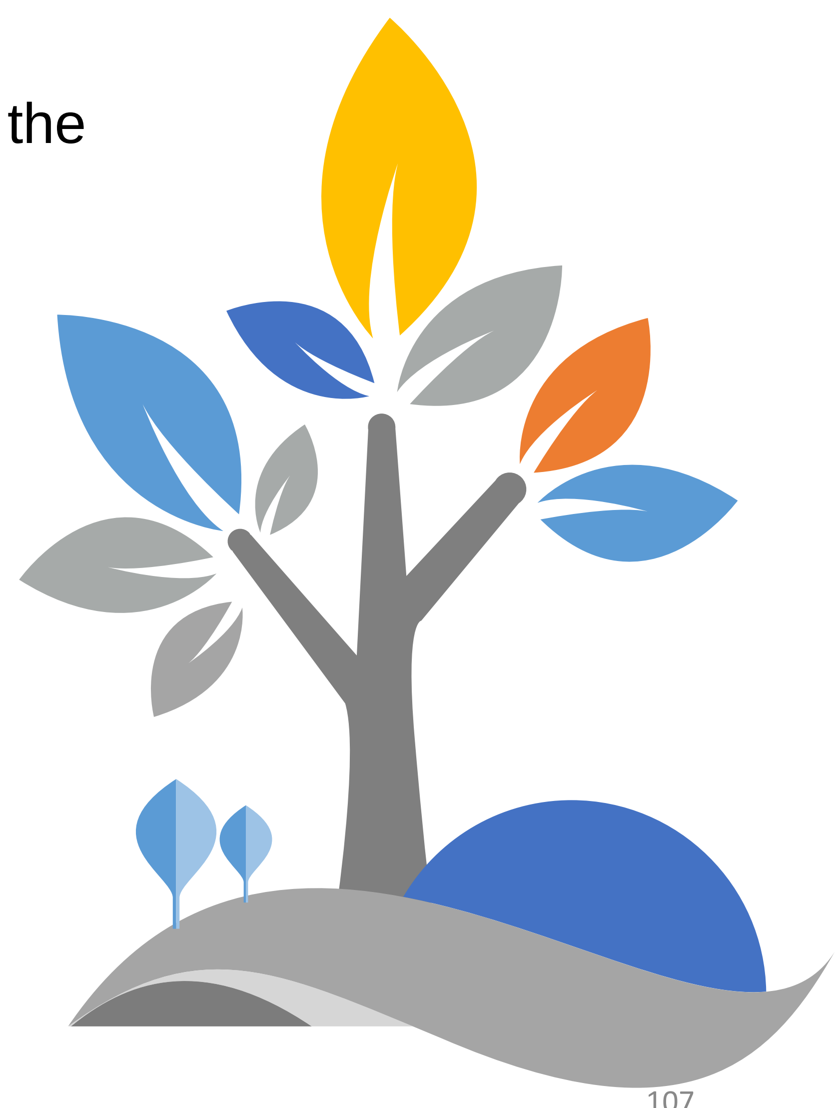
PROJECT MANAGEMENT PLAN UPDATES

(Any component)

03

PROJECT DOCUMENTS UPDATES.

(Change log)







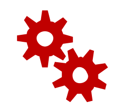
4.7 Close Project or Phase



the project manager reviews the project management plan to ensure that all project work is completed and that the project has met its objectives.

Actions and activities necessary to satisfy completion or exit criteria for the phase or project

- Making certain that all documents and deliverables are up-to-date and that all issues are resolved.
- Confirming the delivery and formal acceptance of deliverables by the customer.
- Ensuring that all costs are charged to the project.
- Closing project accounts.
- Reassigning personnel.
- Dealing with excess project material.
- Reallocating project facilities, equipment, and other resources.
- Elaborating the final project reports as required by organizational policies.



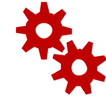
4.7 Close Project or Phase

Legend:
New Item
Already Explained Item



Inputs, Tools & Techniques, and Outputs

Inputs		Tools & Techniques		Outputs	
Project charter	14	Expert judgment	35	Project documents updates (Lessons learned register)	29
Project management plan (All components)	3	Data analysis (Document analysis)	5	Final product, service, or result transition	1
Project documents (Assumption log)	14	Data analysis (Regression analysis)	1	Final report	1
Project documents (Basis of estimates)	6	Data analysis (Trend analysis)	7	OPA updates	10
Project documents (Change log)	6	Data analysis (Variance analysis)	5		
Project documents (Issue log)	12	Meetings	28		
Project documents (Lessons learned register)	27				
Project documents (Milestone list)	9				
Project documents (Project communications)	4				
Project documents (Quality control measurements)	2				
Project documents (Quality reports)	5				
Project documents (Requirements documentation)	13				
Project documents (Risk register)	22				
Project documents (Risk report)	10				
Accepted deliverables	1				
Business documents (Business case)	6				
Business documents (Benefits management plan)	5				
Agreements	11				
Procurement documentation	4				
Organizational process assets	47				



4.7 Close Project or Phase



Data Flow Diagrams

4.1
Develop
Project Charter

• Project Charter

Project
Management
Plan

Project management plan
• All components

Project
Documents

Project documents
• Assumption log
• Basis of estimates
• Change log
• Issue log
• Lessons learned register
• Milestone list
• Project communications
• Quality control measurements
• Quality reports
• Requirements documentation
• Risk register
• Risk report

5.5
Validate
Scope

• Accepted deliverables

12.1
Plan
Procurement
Management

• Procurement documentation

4.7
Close
Project or
Phase

Customer

• Final product, service, or
result transition

Project
Documents

Project documents updates
• Lessons learned register

Enterprise/
Organization

• Final report
• Organizational process
assets updates

12.2
Conduct
Procurements

• Agreements

Business
Documents

• Business case
• Benefits management plan

Enterprise/
Organization

• Organizational process assets



4.7 Close Project or Phase Input

01 PROJECT CHARTER

02 PROJECT MANAGEMENT PLAN

03 PROJECT DOCUMENTS

04 ACCEPTED DELIVERABLES.

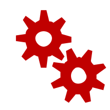
05 BUSINESS DOCUMENTS.

06 AGREEMENTS.

07 PROCUREMENT DOCUMENTATION.

08 OPA.





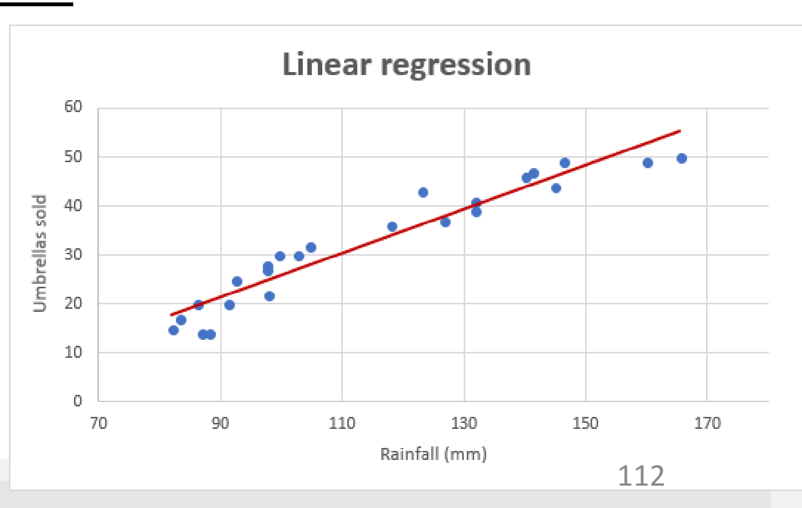
4.7 Close Project or Phase Tools & Techniques



01 EXPERT JUDGMENT

02 DATA ANALYSIS

- **Document analysis.**
  Review the available documentation will help in **identifying** lessons learned and knowledge sharing for future projects and organizational assets improvement.
- **Regression analysis.**
  Analyzes the interrelationships between different project variables that contributed to the project outcomes to improve performance on future projects.
- **Trend analysis.**
- **Variance analysis.**



03 MEETINGS



4.7 Close Project or Phase Output



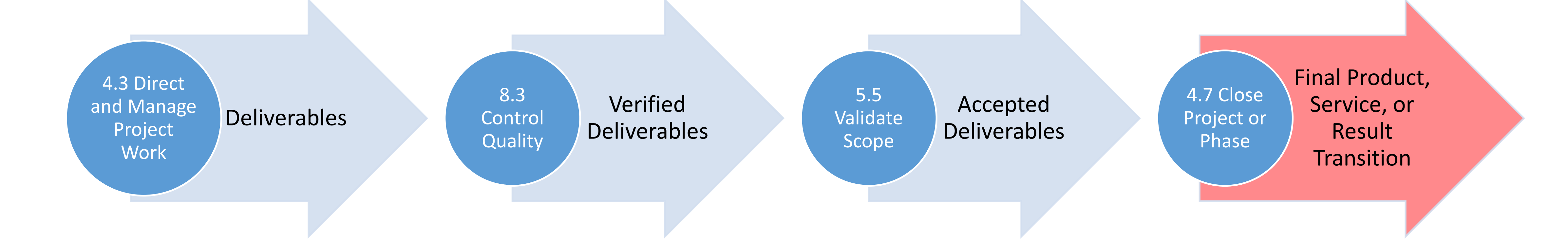
01 **PROJECT DOCUMENTS UPDATES**

02 **FINAL PRODUCT, SERVICE, OR RESULT TRANSITION**

03 **FINAL REPORT**

The final report provides a summary of the project performance.

04 **OPA UPDATES**





5. PROJECT SCOPE MANAGEMENT



Presented by :
Abdulfattah Ajlan
Certified PMP Trainer

Project Scope Management





Includes the processes required to ensure that the project includes all the work required, and only the work required, to complete the project successfully.



primarily concerned with defining and controlling what is and is not included in the project.



Key concepts for Project Scope Management



The term “scope” can refer to:

Product scope. The features and functions that characterize a product, service, or result.

Project scope. The work performed to deliver a product, service, or result with the specified features and functions.

The term “project scope” is sometimes viewed as including product scope.

- Project scope completion is measured against the project management plan.
- Product scope completion is measured against the product requirements

- The **Uncontrolled expansion** to product or project scope without adjustments to time, cost, and resources is referred to as **Scope Creep.**



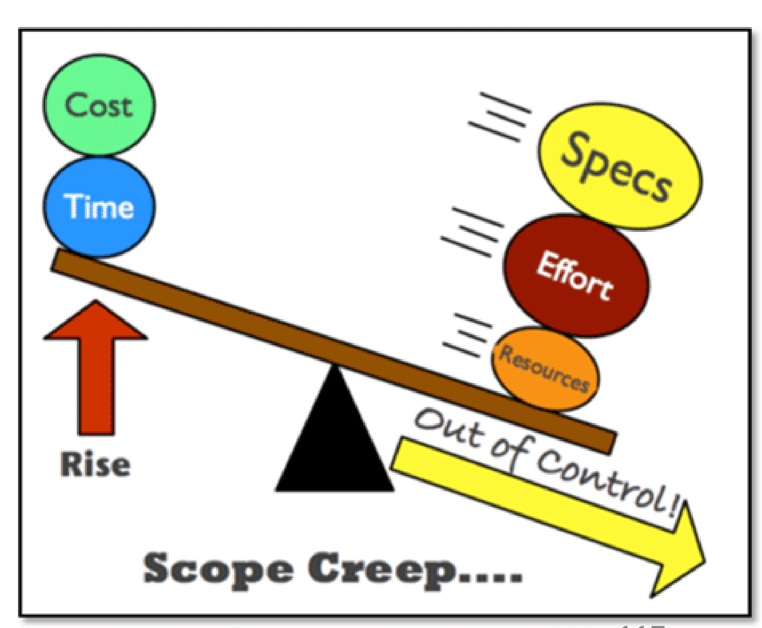
Scope Creep

(Requirement **creep**, Function **creep**) Refers to changes, continuous or uncontrolled growth in a project's scope. It occurs when the scope of a project is not properly defined, documented, or controlled.

Gold Plating concept

Giving the customer more than what he originally asked for.





Knowledge Areas	Project Management Process Groups				
	Initiating	Planning	Executing	Monitoring and Controlling	Closing
Project Integration Management	4.1 Develop Project Charter	4.2 Develop Project Management Plan	4.3 Direct and Manage Project Work 4.4 Manage Project Knowledge	4.5 Monitor and Control Project Work 4.6 Perform Integrated Change Control	4.7 Close Project
Project Scope Management		5.1 Plan Scope Management 5.2 Collect Requirements 5.3 Define Scope 5.4 Create WBS		5.5 Validate Scope 5.6 Control Scope	
Project Schedule Management		6.1 Plan Schedule 6.2 Define Activities 6.3 Sequence Activities 6.4 Estimate Activity Durations 6.5 Develop Schedule Management		6.6 Control Schedule	
Project Cost Management		7.1 Plan Cost Management 7.2 Estimate Costs 7.3 Determine Budge		7.4 Control Costs	
Project Quality Management		8.1 Plan Quality Management	8.2 Manage Quality	8.3 Control Quality	
Project Resource Management		9.1 Plan Resource Management 9.2 Estimate Activity Resources	9.3 Acquire Resources 9.4 Develop Team 9.5 Manage Team	9.6 Control Resources	
Project Communications Management		10.1 Plan Communications Management	10.2 Manage Communications	10.3 Monitor Communications	
Project Risk Management		11.1 Plan Risk Management 11.2 Identify Risks 11.3 Perform Qualitative Risk Analysis 11.4 Perform Quantitative Risk Analysis 11.5 Plan Risk Responses	11.6 Implement Risk Responses	11.7 Monitor Risks	
Project Procurement Management		12.1 Plan Procurement Management	12.2 Conduct Procurements	12.3 Control Procurements	
Project Stakeholder Management	13.1 Identify Stakeholders	13.2 Plan Stakeholder Engagement	13.3 Manage Stakeholder Engagement	13.4 Monitor Stakeholder Engagement	





5.1 Plan Scope Management



Inputs, Tools & Techniques, and Outputs

Inputs		Tools & Techniques		Outputs	
Project charter	14	Expert judgment	35	Scope management plan	1
Project management plan (Quality management plan)	7	Data analysis (Alternatives analysis)	13	Requirements management plan	1
Project management plan (Project life cycle description)	1	Meetings	28		
Project management plan (Development approach)	2				
Enterprise environmental factors	40				
Organizational process assets	47				



5.1 Plan Scope Management



Data Flow Diagrams

4.1
Develop Project Charter

- Project charter

Project Management Plan

- Quality management plan
- Project life cycle description
- Development approach

Enterprise/ Organization

- Enterprise environmental factors
- Organizational process assets

5.1
Plan Scope Management

- Scope management plan
- Requirements management plan

Project Management Plan

IPMC

5.1 Plan Scope Management Input

01 **PROJECT CHARTER**

02 **PROJECT MANAGEMENT PLAN**

- Quality management plan
- **Project life cycle description**: determines the series of phases that a project passes through from its inception to the end of the project.
- **Development approach**: defines whether waterfall, iterative, adaptive, agile, or a hybrid development approach will be used.

03 **ENTERPRISE ENVIRONMENTAL FACTORS**

04 **ORGANIZATIONAL PROCESS ASSETS**





5.1 Plan Scope Management Tools & Techniques

01 **Expert judgment**

02 **Data Analysis**

- Alternatives analysis

03 **Meetings**



IPMC

5.1 Plan Scope Management Output

01 SCOPE MANAGEMENT PLAN

Component of the project management plan that describes **how the scope** will be defined, developed, monitored, controlled, and validated;

02 REQUIREMENTS MANAGEMENT PLAN

- Component of the project management plan that describes **how project and product requirements** will be analyzed, documented, and managed.
- Some organizations refer to it as a **Business analysis plan**.



IPMC

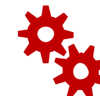
5.2 Collect Requirements

Legend:
New Item
Already Explained Item

Inputs, Tools & Techniques, and Outputs

Inputs		Tools & Techniques		Outputs	
Project charter	14	Expert judgment	35	Requirements documentation	1
Project management plan (Scope management plan)	8	Data gathering (Brainstorming)	6	Requirements traceability matrix	1
Project management plan (Requirements management plan)	7	Data gathering (Interviews)	8		
Project management plan (Stakeholder engagement plan)	8	Data gathering (Focus groups)	3		
Project documents (Assumption log)	14	Data gathering (Questionnaires and surveys)	3		
Project documents (Lessons learned register)	27	Data gathering (Benchmarking)	3		
Project documents (Stakeholder register)	17	Data analysis (Document analysis)	5		
Business documents (Business case)	6	Decision making (Voting)	7		
Agreements	11	Decision making (Autocratic decision making)	2		
Enterprise environmental factors	40	Decision making (Multicriteria decision analysis)	8		
Organizational process assets	47	Data representation (Affinity diagrams)	2		
		Data representation (Mind mapping)	3		
		Interpersonal and team skills (Nominal group technique)	1		
		Interpersonal and team skills (Observation/conversation)	3		
		Interpersonal and team skills (Facilitation)	9		
		Context diagram	1		
		Prototypes	1		

CORRECTION



5.2 Collect Requirements



Data Flow Diagrams

4.1
Develop
Project Charter

- Project charter

Project
Management
Plan

Project management plan
- Requirements management plan
- Scope management plan
- Stakeholder engagement plan

Project
Documents

Project documents
- Assumption log
- Lessons learned register
- Stakeholder register

Business
Documents

Business documents
- Business case

12.2
Conduct
Procurements

- Agreements

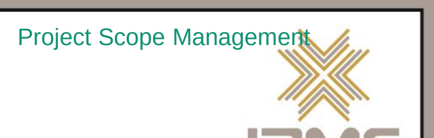
Enterprise/
Organization

- Enterprise environmental factors
- Organizational process assets

5.2
Collect
Requirements

- Requirements documentation
- Requirements traceability matrix

Project
Documents



5.2 Collect Requirements Input

01 **PROJECT CHARTER**

02 **PROJECT MANAGEMENT PLAN**

- Scope management plan.
- Requirements management plan.
- Stakeholder engagement plan.

03 **PROJECT DOCUMENTS**

- Assumption Log.
- Lessons learned register.
- Stakeholder Register.

04 **BUSINESS DOCUMENTS**

05 **AGREEMENTS**

06 **EEF**

07 **OPA**





5.2 Collect Requirements

Tools & Techniques



01 DATA GATHERING

Brainstorming. generate and collect multiple ideas related to project and product requirements.

Focus groups. Bring together stakeholders and subject matter experts to learn about their expectations.



Interviews. Formal/ informal approach to elicit information from stakeholders by talking to them directly.



Questionnaires & surveys. Sets of questions designed to quickly accumulate information

Benchmarking Comparing actual or planned products, to those of comparable organizations to identify best practices, generate ideas for improvement.



5.2 Collect Requirements

Tools & Techniques



02 **EXPERT JUDGMENT**

03 **DATA ANALYSIS**

Document analysis: reviewing and assessing any relevant documented information to elicit requirements by analyzing existing documentation and identifying information relevant to the requirements.

04 **DECISION MAKING**

Voting.

- Unanimity - everyone agrees on a single course of action.
- Majority – More than 50% of the members agree.
- Plurality. – Largest block in a group decides.



Autocratic decision making one individual takes responsibility for making the decision.

Multi-criteria decision analysis uses a decision matrix to provide a systematic analytical approach for establishing criteria to evaluate and rank many ideas.

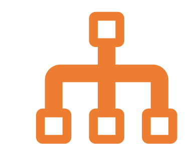


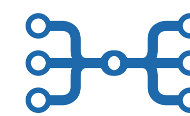


5.2 Collect Requirements

Tools & Techniques

05 DATA REPRESENTATION





- **Affinity diagrams** - large numbers of ideas to be classified into **groups** for review and analysis.
- **Mind mapping** - consolidates ideas created through individual brainstorming sessions into a single map to reflect commonality and differences in understanding and to generate new ideas.

06 INTERPERSONAL AND TEAM SKILLS

- **Nominal group technique:** enhances **brainstorming** with a **voting** process used to rank the most useful ideas for further brainstorming or for prioritization.
- **Observation/conversation:** A direct way of viewing individuals in their environment and how they perform their jobs or tasks and carry out processes in order to collect the requirements "job shadowing".
- **Facilitation.**

07 Prototypes:

Prototypes: Providing a model of the expected product before actually building it, to obtaining early feedback on requirements

Affinity Diagram

ideas classified into groups



Staff	Distribution	Quality	Capacity
Lack of staff training	Not enough trucks.	Variable ingredients quality	Insufficient ovens
Difficulties recruiting	Cooling systems in trucks unreliable.	Packaging not strong enough	Limited storage space
High overtime	Product damaged in transit		Seasonal demand



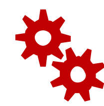
Mind Map

consolidates ideas into a single map to reflect commonality and differences

London visit

- **Activities**
  - Sailing
  - Snorkeling
  - Sightseeing
    - Tower of London
    - Buckingham palace
    - British Museum
- **Dates and times**
  - To London
    - March 5 - 2PM
    - BA 2345
  - Back home
    - March 22 - 10AM
    - BA 2346
- **Things to Bring**
  - Clothes
    - Shorts and t-shirts
    - Sandals
    - Umbrella
    - Jeans
  - Camera
  - Sunglasses
  - Money
- **Before leaving**
  - Dog to kennels
  - Turn off computer
  - Set security

IPMC

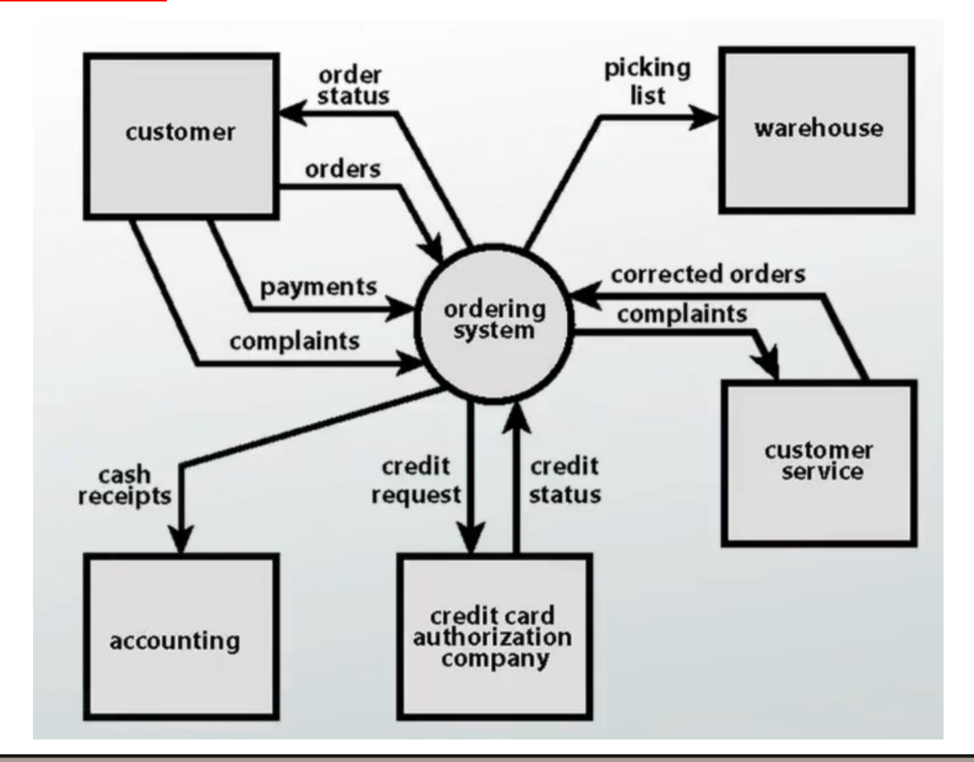


5.2 Collect Requirements

Tools & Techniques

08 CONTEXT DIAGRAM

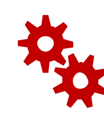
Visually depict the **product scope** by showing a business system, and how people and other systems (actors) interact with it.



HR Talent Management Systems of ABC Company

Internal Users
External Users
Hiring Managers
Recruiting Agencies
Internal User Profiles
External Jobs Postings
Internal Associates
Job Seekers
Internal Jobs Postings
External User Profiles
Internal Full-Time and Part-Time Contractors
External Jobs Websites
Internal Users
External Users

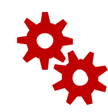
IPMC



5.2 Collect Requirements Output

01 **REQUIREMENTS DOCUMENTATION**

- **Business requirements.** describe the higher-level needs of the organization as a whole.
- **Stakeholder requirements.** describe needs of a stakeholder or stakeholder group.
- **Solution requirements.** describe features, functions, and characteristics of the product, service, or result that will meet the business and stakeholder requirements.
  - **Functional** Ex: actions, processes, data, and interactions that the product should execute
  - **Nonfunctional** Ex: reliability, security, performance, safety, level of service, supportability, retention.
- **Transition and readiness requirements.** Capabilities needed to transition from the current state to the desired future state, such as training requirements.
- **Project requirements.** actions, processes, or other conditions the project needs to meet.
- **Quality requirements.** Ex: include tests, certifications, validations, etc.



5.2 Collect Requirements Output

02 Requirements Traceability Matrix. is a grid that links product requirements from their origin to the deliverables that satisfy them, it provides a structure for managing changes to the product scope

Requirements Traceability Matrix

Project Name:	
Cost Center:	
Project Description:	

ID	Associate ID	Requirements Description	Business Needs, Opportunities, Goals, Objectives	Project Objectives	WBS Deliverables	Product Design	Product Development	Test Cases
001	1.0							
	1.1							
	1.2							
	1.2.1							
002	2.0							
	2.1							
	2.1.1							

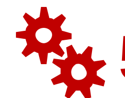


5.3 Define Scope

Legend:
New Item
Already Explained Item

Inputs, Tools & Techniques, and Outputs

Inputs		Tools & Techniques		Outputs	
Project charter	14	Expert judgment	35	Project scope statement	1
Project management plan (Scope management plan)	8	Data analysis (Alternatives analysis)	13	Project documents updates (Assumption log)	17
Project documents (Assumption log)	14	Decision making (Multicriteria decision analysis)	8	Project documents updates (Requirements documentation)	7
Project documents (Requirements documentation)	13	Interpersonal and team skills (Facilitation)	9	Project documents updates (Requirements traceability matrix)	7
Project documents (Risk register)	22	Product analysis	1	Project documents updates (Stakeholder register)	12
Enterprise environmental factors	40				
Organizational process assets	47				



5.3 Define Scope



Data Flow Diagrams

4.1
Develop Project Charter

- Project charter

Project Management Plan

Project management plan
- Scope management plan

Project Documents

Project documents
- Assumption log
- Requirements documentation
- Risk register

Enterprise/ Organization

- Enterprise environmental factors
- Organizational process assets

5.3
Define Scope

- Project scope statement

Project Documents

Project document updates
- Assumption log
- Requirements documentation
- Requirements traceability matrix
- Stakeholder register



5.3 Define Scope Input

01 **PROJECT CHARTER**

02 **PROJECT MANAGEMENT PLAN**

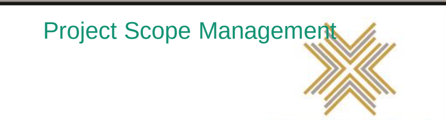
03 **PROJECT DOCUMENTS**

- **Assumption log**: identifies assumptions and constraints about the product, project, environment, stakeholders, and other factors that can influence the project
- **Requirements documentation**.
- **Risk register**.

04 **ENTERPRISE ENVIRONMENTAL FACTORS**

05 **ORGANIZATIONAL PROCESS ASSETS**







5.3 Define Scope Tools & Techniques

01 **EXPERT JUDGMENT**

02 **DATA ANALYSIS**

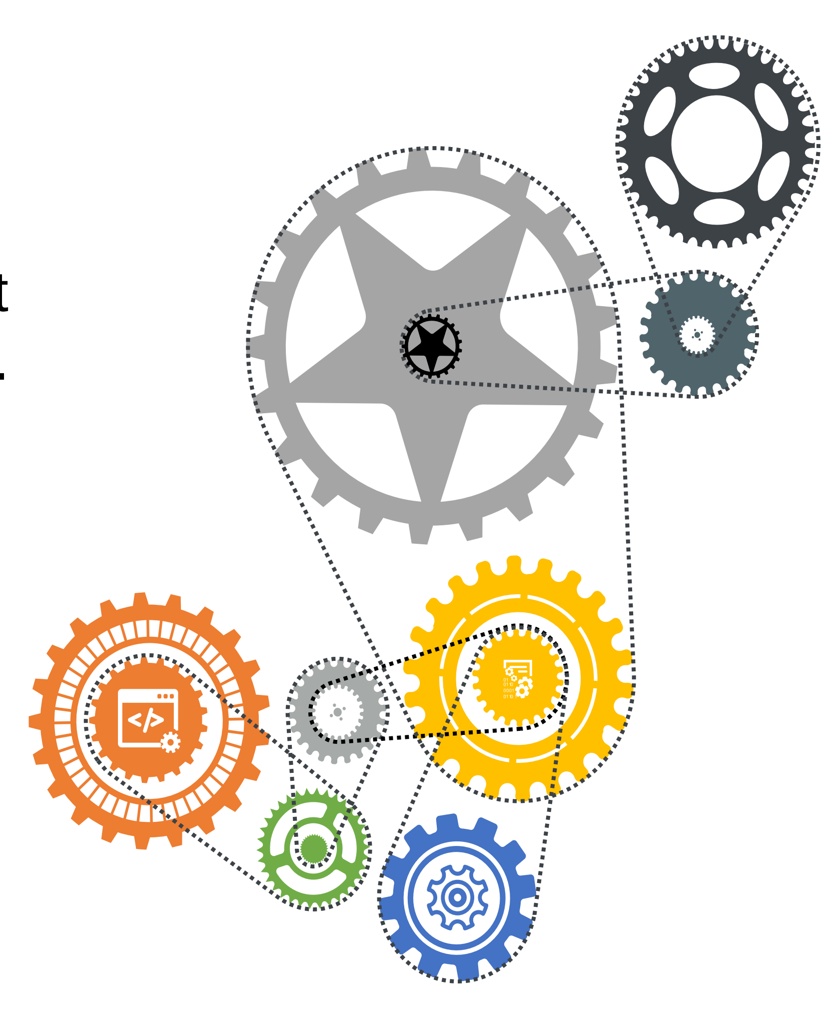
Alternatives analysis: can be used to evaluate ways to meet the requirements and the objectives identified in the charter.

03 **DECISION MAKING**

04 **INTERPERSONAL AND TEAM SKILLS -** Facilitation

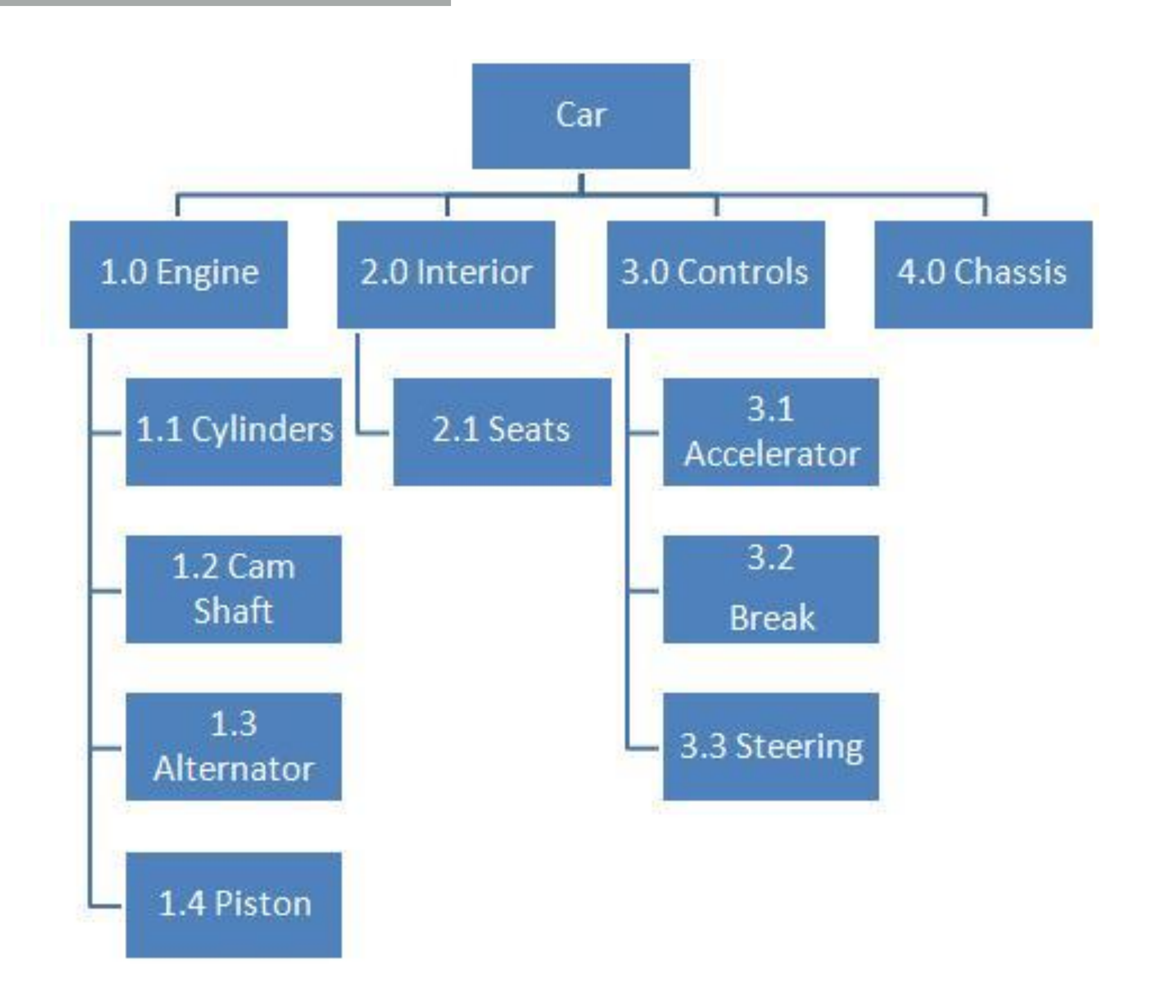
05 **PRODUCT ANALYSIS**

used to define products and services. It includes **asking questions about a product or service and forming answers** to describe the use, characteristics, and other relevant aspects of what is going to be delivered.





5.3 Define Scope Tools & Techniques



Product Analysis

IPMC



5.3 Define Scope Output



01 PROJECT SCOPE STATEMENT

- **Description** of the <u>project scope</u>, <u>major deliverables</u>, and <u>exclusions</u>. It contains a detailed description of the scope components.
- The detailed project scope statement includes:
  - Product scope description.
  - Deliverables.
  - Acceptance criteria.

02 PROJECT DOCUMENTS UPDATES

- Assumption log.
- Requirements documentation.
- Requirements traceability matrix.
- Stakeholder register.





5.3 Define Scope Output



Project Title: PATHWAYS INITIATIVE **Date Prepared:** 9/1/2016

Product Scope Description

Pathways will develop and implement course maps for all certificates and degrees with the objective of preventing students from taking courses that do not transfer or prepare them for a career. Further, we will analyze and design student support processes and areas that increase students' ability to successfully navigate their way through their educational experience.

Project Deliverables

- Create Transfer Pathways maps for all viable degrees and Career Pathways maps for all viable certificates
- Create Student intake and support systems that have well-defined Pathways to student completion of educational goals
- Develop Student-centered classrooms with classroom content driven by Student Learning Outcomes (SLOs) and not textbook

Project Acceptance Criteria

- Successful implementation of Degree/Certificate maps
- Successful implementation of Student Support maps
- Initial reduction in average credit hours to degree or certificate of 5%
- Initial increase in completion rates of 5%

Project Exclusions

Since Student Success is the most important value of San Jacinto College and all areas of the College have a direct or indirect affect on student success, all employees will be expected to support Pathways with their time and expertise.
Some work will be occurring concurrently and will complement Pathways development, such as:

- SACSCOC ten-year reaffirmation of accreditation
- Open Educational Resources textbook review and selection

Statement of Work VS Scope Statement



بيان العمل   بيان نطاق المشروع

Statement of Work (SOW)	Project Scope Statement
High level information	Detailed information
A narrative description of products, services, or results to be delivered by the project	description of the project scope, major deliverables, assumptions, and constraints



5.4 Create WBS

Legend:
New Item
Already Explained Item

Inputs, Tools & Techniques, and Outputs

Inputs		Tools & Techniques		Outputs	
Project management plan (Scope management plan)	8	Expert judgment	35	Scope baseline	1
Project documents (Project scope statement)	1	Decomposition	2	Project documents updates (Assumption log)	17
Project documents (Requirements documentation)	13			Project documents updates (Requirements documentation)	7
Enterprise environmental factors	40				
Organizational process assets	47				



5.4 Create WBS



Data Flow Diagrams

Project Management Plan

Project management plan
- Scope management plan

Project Documents

Project documents
- Project scope statement
- Requirements documentation

Enterprise/ Organization

- Enterprise environmental factors
- Organizational process assets

5.4 Create WBS

Project Management Plan

- Scope baseline

Project Documents

Project document updates
- Assumption log
- Requirements documentation





5.4 Create WBS

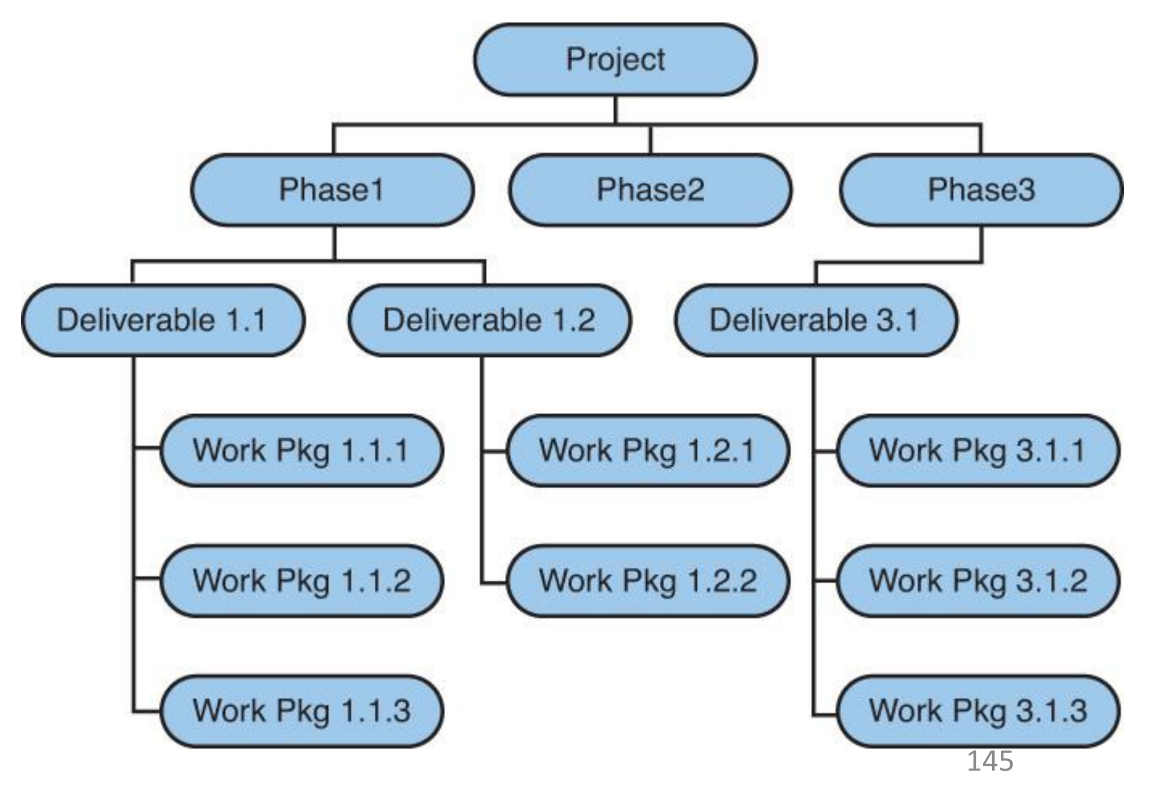


CREATE WBS IS the process of subdividing project deliverables and project work into smaller, more manageable components.



WBS is a hierarchical decomposition of the total scope of work. specified in the current approved project scope statement.

The 100% Rule: the sum of the work at the "child" level must equal 100% of the work represented by the "parent".





5.4 Create WBS Input

01 **PROJECT MANAGEMENT PLAN**

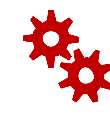
02 **PROJECT DOCUMENTS**

- Project scope statement.
- Requirements documentation.

03 **ENTERPRISE ENVIRONMENTAL FACTORS (EEF)**

04 **ORGANIZATIONAL PROCESS ASSETS (OPA)**





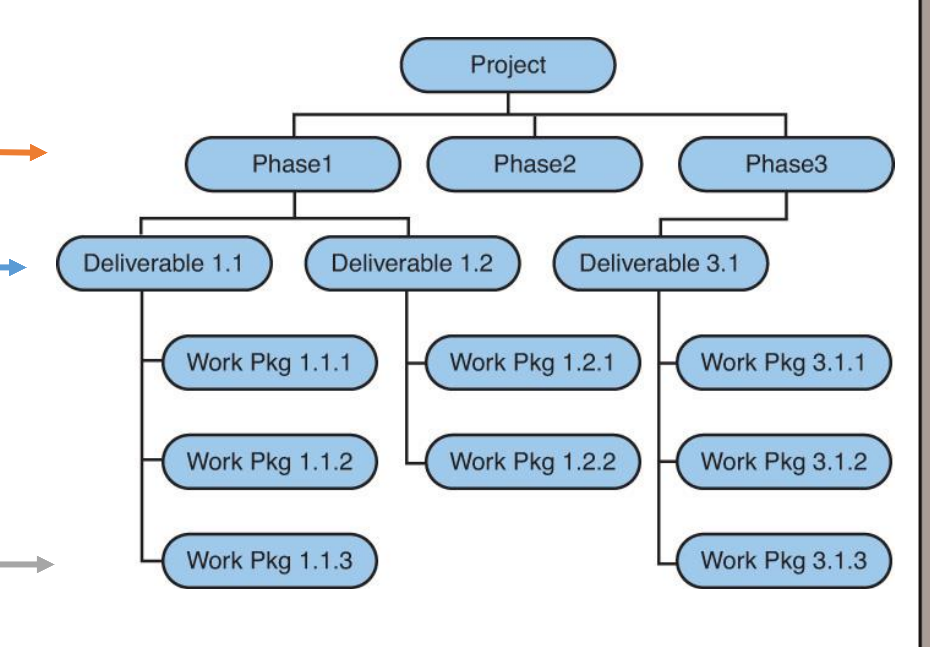
5.4 Create WBS Tools & Techniques



01 **EXPERT JUDGMENT**

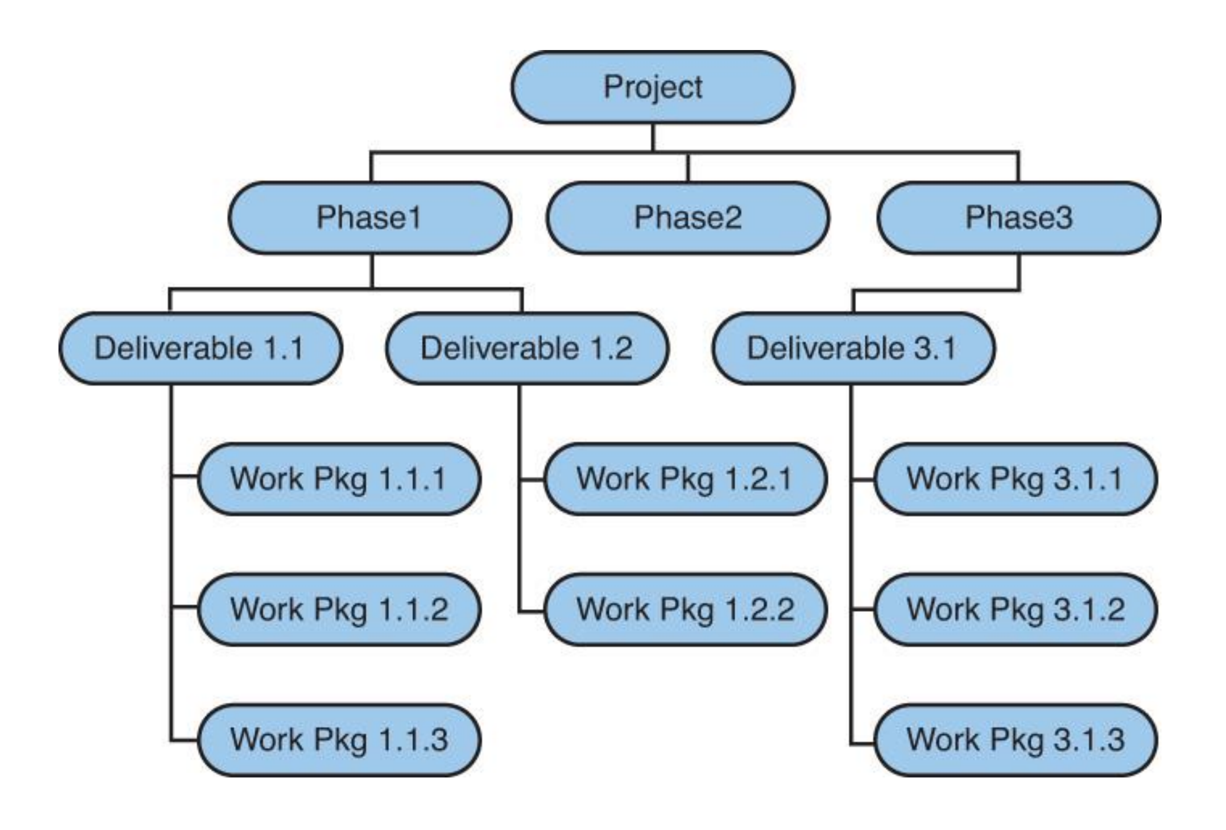
02 **DECOMPOSITION** is a technique used for dividing and subdividing the project scope and project deliverables into smaller, more manageable parts.

- **Control account** is a management control point where scope, budget, and schedule are integrated and compared to the earned value for performance measurement.
- **Planning package** is a work breakdown structure component below the control account and above the work package with known work
- **The work package** is the work defined at the lowest level of the WBS for which cost and duration can be estimated and managed.



IPMC

5.4 Create WBS



- **100% Rule**
- **Indexing**
- **No Time Sequencing**
- **WBS Dictionary**





01 SCOPE BASELINE

- **Project scope statement.** Description of the project scope, major deliverables, and exclusions
- **WBS.**
- **WBS Dictionary:** it is a document that provides detailed deliverable, activity, and scheduling information about each component in the WBS. It includes Code of account identifier, Description of work, Assumptions and constraints, Responsible organization, Schedule milestones, Associated schedule activities,

02 PROJECT DOCUMENTS UPDATES

- Assumption log.
- Requirements documentation.



5.4 Create WBS

WBS DICTIONARY

Project Title: ______________________ Date Prepared: ______________________

Work Package Name:	WBS ID:
Description of Work:	
Milestones: 1. 2. 3.	Due Dates:

ID	Activity	Resource	Labor			Material			Total Cost
			Hours	Rate	Total	Units	Cost	Total	

Quality Requirements:

Acceptance Criteria:

Technical Information:

Contract Information:

5.4 Create WBS Excersice

Fahad decided to renovate his house. He decided to repaint walls for 3 rooms, buy new kitchen and replacing light bulb

Since they didn't have enough budget; they decides to save some money from their monthly salary for 2 months.

"PMP Decotation Project"

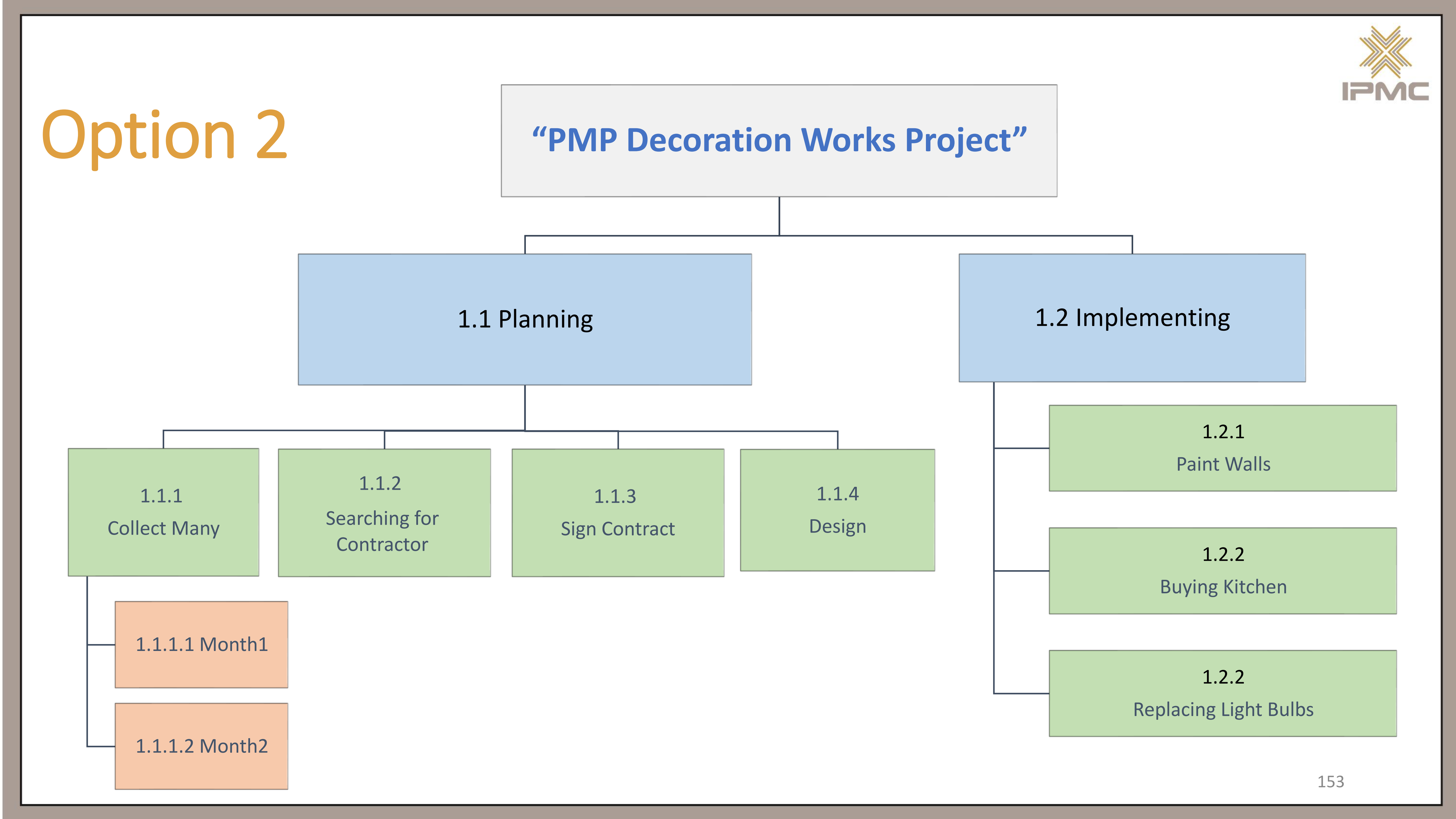
Could you create WBS for this project?



Option 1

"PMP Decoration Works Project"

- 1.1 Collect Money
  - 1.1.1 Month 1
  - 1.1.2 Month 2
- 1.2 Paint Walls
  - 1.2.1 Room 1
  - 1.2.2 Room 2
  - 1.2.3 Room 3
- 1.3 Buying Kitchen
  - 1.3.1 Searching for supplier
  - 1.3.2 Pay Money
  - 1.3.3 Installation Kitchen
- 1.4 Replacing Light Bulbs
  - 1.4.1 Remove old bulbs
  - 1.4.2 Install new bulbs


Option 2
IPMC
"PMP Decoration Works Project"
1.1 Planning
1.2 Implementing
1.1.1
Collect Many
1.1.2
Searching for
Contractor
1.1.3
Sign Contract
1.1.4
Design
1.1.1.1 Month1
1.1.1.2 Month2
1.2.1
Paint Walls
1.2.2
Buying Kitchen
1.2.2
Replacing Light Bulbs
153



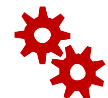


5.5 Validate Scope

Legend:
New Item
Already Explained Item

Inputs, Tools & Techniques, and Outputs

Inputs		Tools & Techniques		Outputs	
Project management plan (Scope management plan)	8	Inspection	3	Accepted deliverables	1
Project management plan (Requirements management plan)	7	Decision making (Voting)	7	Work performance information	10
Project management plan (Scope baseline)	16			Change requests	24
Project documents (Lessons learned register)	27			Project documents updates (Lessons learned register)	29
Project documents (Quality reports)	5			Project documents updates (Requirements documentation)	7
Project documents (Requirements documentation)	13			Project documents updates (Requirements traceability matrix)	7
Project documents (Requirements traceability matrix)	7				
Verified deliverables	1				
Work performance data	10				



5.5 Validate Scope



Data Flow Diagrams

Inputs

Project Management Plan

Project management plan
- Scope management plan
- Requirements management plan
- Scope baseline

4.3 Direct and Manage Project Work
- Work performance data

8.3 Control Quality
- Verified deliverables

Project Documents

Project documents
- Lessons learned register
- Quality report
- Requirements documentation
- Requirements traceability matrix

5.5 Validate Scope

Outputs

4.7 Close Project or Phase
- Accepted deliverables

4.6 Perform Integrated Change Control
- Change requests

4.5 Monitor and Control Project Work
- Work performance information

Project Documents

Project documents updates
- Lessons learned register
- Requirements documentation
- Requirements traceability matrix





5.5 Validate Scope Input

01 **Project management plan**

- Scope management plan
- Requirements management plan
- Scope baseline

02 **Project documents**

- Lessons learned register
- Quality reports
- Requirements documentation
- Requirements traceability matrix



03 **Verified deliverables**: Verified deliverables are project deliverables that are completed and checked for correctness through the Control Quality process.

04 **Work performance data**



5.5 Validate Scope Tools & Techniques



01 INSPECTION

- Includes activities such as measuring, examining, and validating to determine whether work and deliverables meet requirements and product acceptance criteria.
- Inspections are sometimes called reviews, product reviews, and walkthroughs.

02 DECISION MAKING

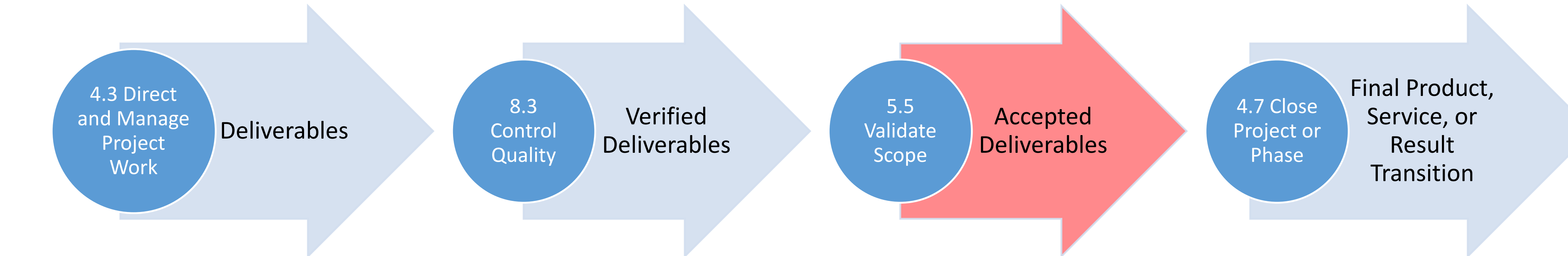
Voting is used to reach a conclusion when the validation is performed by the project team and other stakeholders.





5.5 Validate Scope Output

01 ACCEPTED DELIVERABLES



02 WORK PERFORMANCE INFORMATION

03 CHANGE REQUESTS

04 PROJECT DOCUMENTS UPDATES

- Lessons learned register.
- Requirements documentation.
- Requirements traceability matrix.

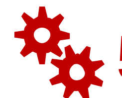
IPMC

5.6 Control Scope

Legend:
New Item
Already Explained Item

Inputs, Tools & Techniques, and Outputs

Inputs		Tools & Techniques		Outputs	
Project management plan (Scope management plan)	8	Data analysis (Variance analysis)	5	Work performance information	10
Project management plan (Requirements management plan)	7	Data analysis (Trend analysis)	7	Change requests	24
Project management plan (Change management plan)	4			Project management plan updates (Scope management plan)	1
Project management plan (Configuration management plan)	3			Project management plan updates (Scope baseline)	5
Project management plan (Scope baseline)	16			Project management plan updates (Schedule baseline)	9
Project management plan (Performance measurement baseline)	3			Project management plan updates (Cost baseline)	12
Project documents (Lessons learned register)	27			Project management plan updates (Performance measurement baseline)	3
Project documents (Requirements documentation)	13			Project documents updates (Lessons learned register)	29
Project documents (Requirements traceability matrix)	7			Project documents updates (Requirements documentation)	7
Work performance data	10			Project documents updates (Requirements traceability matrix)	7
Organizational process assets	47				



5.6 Control Scope



Data Flow Diagrams



5.6 Control Scope Input

01 **PROJECT MANAGEMENT PLAN**

- Scope management plan.
- Requirements management plan.
- Change management plan.
- Configuration management plan.
- Scope baseline.
- Performance measurement baseline.

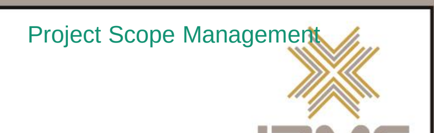
02 **PROJECT DOCUMENTS**

- Lessons learned register
- Requirements documentation.
- Requirements traceability matrix.

03 **WORK PERFORMANCE DATA**

04 **ORGANIZATIONAL PROCESS ASSETS**





5.6 Control Scope Tools & Techniques

01

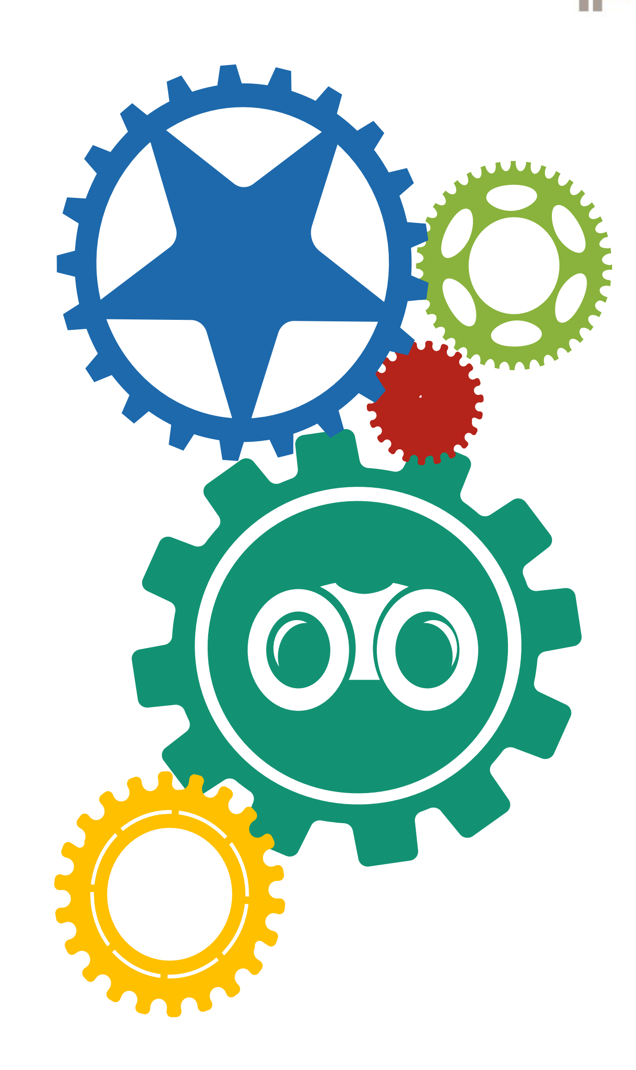
DATA ANALYSIS

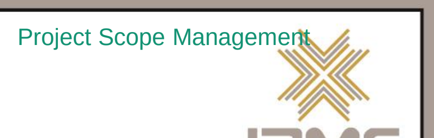
- **Variance analysis.**

Is used to compare the baseline to the actual results and determine if the variance is within the threshold amount or if corrective or preventive action is appropriate.

- **Trend analysis.**

Examines project performance over time to determine if performance is improving or deteriorating.





5.6 Control Scope Output

01 **WORK PERFORMANCE INFORMATION**

02 **CHANGE REQUESTS**

03 **PROJECT MANAGEMENT PLAN UPDATES**

- Scope management plan.
- Scope baseline.
- Schedule baseline.
- Cost baseline.
- Performance measurement baseline.

04 **PROJECT DOCUMENTS UPDATES**

- Lessons learned register.
- Requirements documentation.
- Requirements traceability matrix.





6. PROJECT SCHEDULE MANAGEMENT



Presented by :
Abdulfattah Ajlan
Certified PMP Trainer

Project Schedule Management

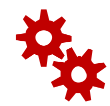


Project Schedule Management includes the processes required to manage the timely completion of the project.

Project scheduling provides a detailed plan that represents **how and when** the project will deliver the products, services, and results defined in the project scope and **serves as**

- Tool for communication
- Managing stakeholders' expectations
- Basis for performance reporting.

Knowledge Areas	Project Management Process Groups				
	Initiating	Planning	Executing	Monitoring and Controlling	Closing
Project Integration Management	4.1 Develop Project Charter	4.2 Develop Project Management Plan	4.3 Direct and Manage Project Work 4.4 Manage Project Knowledge	4.5 Monitor and Control Project Work 4.6 Perform Integrated Change Control	4.7 Close Project
Project Scope Management		5.1 Plan Scope Management 5.2 Collect Requirements 5.3 Define Scope 5.4 Create WBS		5.5 Validate Scope 5.6 Control Scope	
Project Schedule Management		6.1 Plan Schedule Management 6.2 Define Activities 6.3 Sequence Activities 6.4 Estimate Activity Durations 6.5 Develop Schedule		6.6 Control Schedule	
Project Cost Management		7.1 Plan Cost Management 7.2 Estimate Costs 7.3 Determine Budge		7.4 Control Costs	
Project Quality Management		8.1 Plan Quality Management	8.2 Manage Quality	8.3 Control Quality	
Project Resource Management		9.1 Plan Resource Management 9.2 Estimate Activity Resources	9.3 Acquire Resources 9.4 Develop Team 9.5 Manage Team	9.6 Control Resources	
Project Communications Management		10.1 Plan Communications Management	10.2 Manage Communications	10.3 Monitor Communications	
Project Risk Management		11.1 Plan Risk Management 11.2 Identify Risks 11.3 Perform Qualitative Risk Analysis 11.4 Perform Quantitative Risk Analysis 11.5 Plan Risk Responses	11.6 Implement Risk Responses	11.7 Monitor Risks	
Project Procurement Management		12.1 Plan Procurement Management	12.2 Conduct Procurements	12.3 Control Procurements	
Project Stakeholder Management	13.1 Identify Stakeholders	13.2 Plan Stakeholder Engagement	13.3 Manage Stakeholder Engagement	13.4 Monitor Stakeholder Engagement	



6.1 Plan Schedule Management

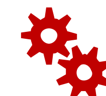
Legend:
New Item
Already Explained Item



Inputs, Tools & Techniques, and Outputs

Inputs		Tools & Techniques		Outputs	
Project charter	14	Expert judgment	35	Schedule management plan	1
Project management plan (Scope management plan)	8	Data analysis (Alternatives analysis)	13		
Project management plan (Development approach)	2	Meetings	28		
Enterprise environmental factors	40				
Organizational process assets	47				





6.1 Plan Schedule Management



Data Flow Diagrams

4.1 Develop Project Charter

- Project charter

Project Management Plan

Project management plan
- Scope management plan
- Development approach

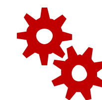
Enterprise/ Organization

- Enterprise environmental factors
- Organizational process assets

6.1 Plan Schedule Management

- Schedule management plan

Project Management Plan



6.1 Plan Schedule Management Input



01 **PROJECT CHARTER**

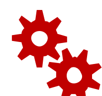
02 **PROJECT MANAGEMENT PLAN**

- Scope management plan.
- **Development approach**: define the scheduling approach, estimating techniques, scheduling tools, and techniques for controlling the schedule.

03 **ENTERPRISE ENVIRONMENTAL FACTORS**

04 **ORGANIZATIONAL PROCESS ASSETS**





6.1 Plan Schedule Management — Tools & Techniques



01 **Expert judgment**

02 **Data Analysis** (Alternatives analysis)

03 **Meetings**



6.1 Plan Schedule Management Output



01 SCHEDULE MANAGEMENT PLAN

- Establishes the criteria and the activities for developing, monitoring, and controlling the schedule.

- It may be **formal or informal**, **highly detailed**, or **broadly framed** based on the needs of the project.
  The schedule management plan can establish the following:
  - Project schedule model development.
  - Release length and iteration numbers.
  - Level of accuracy and Units of measure.
  - Organizational procedures.
  - Control thresholds.
  - Rules of performance measurement.
  - Reporting formats.



6.2 Define Activities

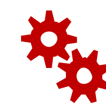
Legend:
New Item
Already Explained Item



Inputs, Tools & Techniques, and Outputs

Inputs		Tools & Techniques		Outputs	
Project management plan (Schedule management plan)	7	Expert judgment	35	Activity list	1
Project management plan (Scope baseline)	16	Decomposition	2	Activity attributes	1
Enterprise environmental factors	40	Rolling wave planning	1	Milestone list	1
Organizational process assets	47	Meetings	28	Change requests	24
				Project management plan updates (Schedule baseline)	9
				Project management plan updates (Cost baseline)	12





6.2 Define Activities



Data Flow Diagrams

Project Management Plan

Project management plan
- Schedule management plan
- Scope baseline

Enterprise/ Organization

- Enterprise environmental factors
- Organizational process assets

6.2 Define Activities

Project Documents

- Activity list
- Activity attributes
- Milestone list

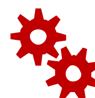
4.6 Perform Integrated Change Control

- Change requests

Project Management Plan

Project management plan updates
- Schedule baseline
- Cost baseline

CORRECTION



6.2 Define Activities Input



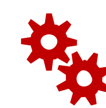
01 **PROJECT MANAGEMENT PLAN**

- Schedule management plan.
- Scope baseline.

02 **ENTERPRISE ENVIRONMENTAL FACTORS**

03 **ORGANIZATIONAL PROCESS ASSETS**





6.2 Define Activities Tools & Techniques



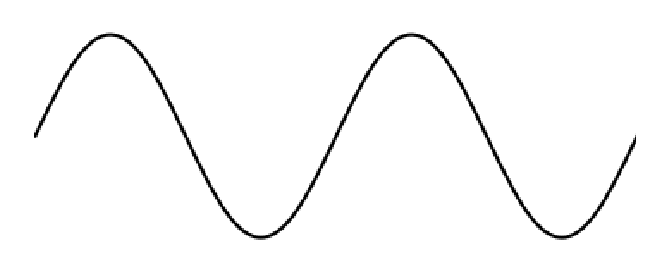
01 **Expert judgment**

02 **Decomposition**

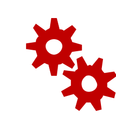
03 **Rolling wave planning**

- Is an **iterative planning technique** in which the work to be accomplished in the near term is planned in detail, while work further in the future is planned at a higher level.
- It is a form of **progressive elaboration** applicable to work packages, planning packages, and release planning when using an agile or waterfall approach.





04 **Meetings**



6.2 Define Activities Output



01 Activity list

Includes the activities required on the project, it's includes an activity identifier and a scope of work description for each activity in sufficient detail to ensure that project team members understand what work is required to be completed. In **rolling wave planning or agile techniques**, the activity list will be **updated periodically** as the project progresses.



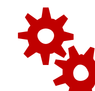
02 Activity attributes

Extend the description of the activity by identifying multiple components associated with each activity.

Examples:

- Constrains - Durations - Resources
- Relations - Name - ID - WBS related





6.2 Define Activities Output



	A	B	C
1	Activity	Start Date	Number of Days
2	Get the Equipments		
3	Build the Arms Cover		

Remember:

No standard templates With PMP.

ID: From activity list	Activity: From activity list				
Description of Work: A description of the activity in enough detail so that the person(s) performing the work understands what is required to complete it.					
Predecessors	Relationship	Lead or Lag	Successor	Relationship	Lead or Lag
Any activities that must occur before the activity.	The nature of the relationship, such as start-to-start, finish-to-start, or finish-to-finish.	Any required delays between activities (lag) or accelerations (lead).	Any activities that must occur after the activity.	The nature of the relationship, such as start- to-start, finish-t-start, or finish-to-finish.	Any required delays between activities (lag) or accelerations (lead).

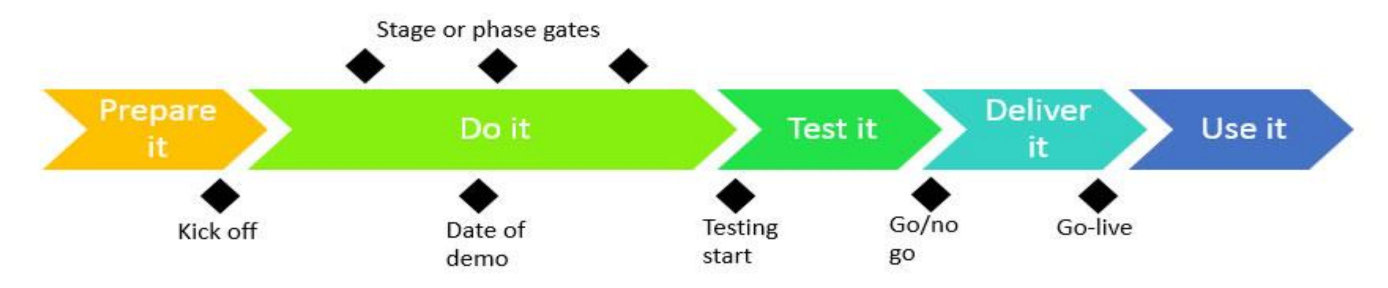


6.2 Define Activities Output



03 Milestone list

- A milestone is a significant point or event in a project.
- A milestone list identifies all project milestones and indicates whether the milestone is mandatory, such as those required by contract, or optional, such as those based on historical information.
- Milestones have zero duration because they represent a significant point or event.

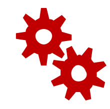


Detailed Design Specification
Focus group
Client's review
Final improvements
Design release to public
Stats analysis

04 Change requests

05 Project management plan updates

- Schedule baseline
- Cost baseline



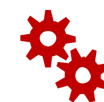
6.3 Sequence Activities

Legend:
New Item
Already Explained Item



Inputs, Tools & Techniques, and Outputs

Inputs		Tools & Techniques		Outputs	
Project management plan (Schedule management plan)	7	Precedence diagramming method	1	Project schedule network diagrams	1
Project management plan (Scope baseline)	16	Dependency determination and integration	1	Project documents updates (Activity attributes)	4
Project documents (Activity attributes)	4	Leads and lags	3	Project documents updates (Activity list)	2
Project documents (Activity list)	4	Project management information system	12	Project documents updates (Assumption log)	17
Project documents (Assumption log)	14			Project documents updates (Milestone list)	2
Project documents (Milestone list)	9				
Enterprise environmental factors	40				
Organizational process assets	47				



6.3 Sequence Activities



Data Flow Diagrams

Project Management Plan

Project management plan
- Schedule management plan
- Scope baseline

Project Documents

Project documents
- Activity attributes
- Activity list
- Assumption log
- Milestone list

Enterprise/ Organization

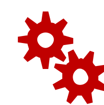
- Enterprise environmental factors
- Organizational process assets

6.3 Sequence Activities

- Project schedule network diagrams

Project Documents

Project documents updates
- Activity attributes
- Activity list
- Assumption log
- Milestone list



6.3 Sequence Activities Input



01 **PROJECT MANAGEMENT PLAN**

- Schedule management plan
- Scope baseline

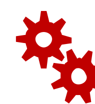
02 **PROJECT DOCUMENTS**

- Activity attributes
- Activity list
- Assumption log
- Milestone list

03 **ENTERPRISE ENVIRONMENTAL FACTORS**

04 **ORGANIZATIONAL PROCESS ASSETS**





6.3 Sequence Activities Tools & Techniques



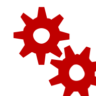
01 Precedence diagramming method (PDM)

- PDM is a technique for constructing a schedule model in which activities are represented by nodes and are graphically linked by one or more logical relationships to show the sequence in which the activities are to be performed.



Note:
PDM Is Activity On Node **(AON)**; It Mean Activity Present By Node.
or Activity On Arrow **(AOA)**; Activity Present By Arrow.





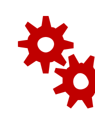
6.3 Sequence Activities Tools & Techniques



01

Precedence diagramming method

- PDM includes four types of dependencies or logical relationships.
  - Finish-to-start (FS).
  - Finish-to-finish (FF).
  - Start-to-start (SS).
  - Start-to-finish (SF).



6.3 Sequence Activities Tools & Techniques



Types of dependencies or logical relationships.

Finish-to-start (FS)

Activity A → Activity B

Start-to-start (SS)

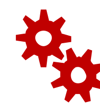
Activity A → Activity B

Finish-to-finish (FF)

Activity A → Activity B

Start-to-finish (SF)

Activity A → Activity B

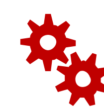


6.3 Sequence Activities Tools & Techniques



02 Dependency determination and integration

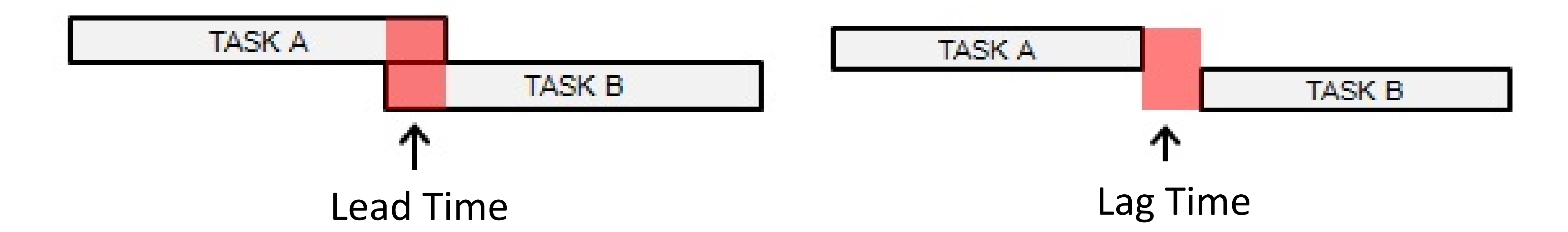
- **Mandatory dependencies. (Hard Logic)**
  Legally or contractually required or inherent in the nature of the work.
- **Discretionary dependencies**
  Preferred logic or preferential logic, or soft logic.
- **External dependencies.**
  Relationship between project activities and non project activities. (suppliers)
- **Internal dependencies.**
  Precedence relationship between project activities and are generally inside the project team's control.



6.3 Sequence Activities Tools & Techniques

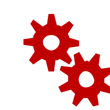


03 Leads and lags



04 Project management information system (PMIS)

Includes scheduling software that has the capability to help plan, organize, and adjust the sequence of the activities; insert the logical relationships, lead and lag values; and differentiate the different types of dependencies. Like: Primavera & MS Projects.



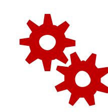
6.3 Sequence Activities Output



01 PROJECT SCHEDULE NETWORK DIAGRAMS

Graphical representation of the logical relationships, also referred to as dependencies, among the project schedule activities.

Begin
A
B
SS
C
D
E
H
F
FS + 15
G
End
SS + 10
I
J
FF
K
L



6.3 Sequence Activities   Output





PROJECT DOCUMENTS UPDATES

- Activity attributes.
- Activity list.
- Assumption log
- Milestone list.

Exercise



Activity	Description	Predecessors	Duration-Days
A	Contracting	-	10
B	Supplying Materials and tools	A	5
C	Electricity (light Bulb)	B	10
D	Wallpaper	B	10
E	Tile	C,D	5
F	Kitchen	E	7

Draw PDM for above activity list

Exercise



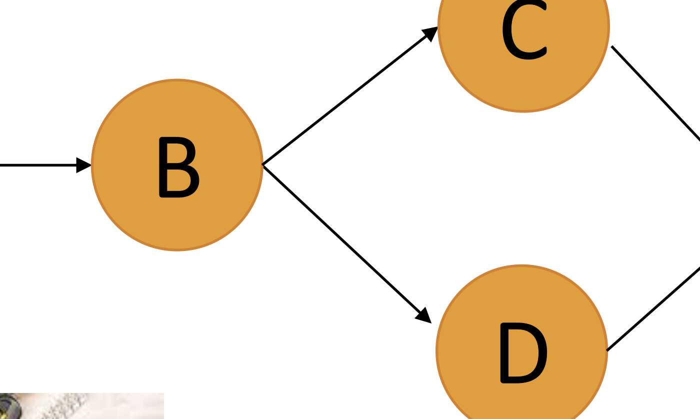


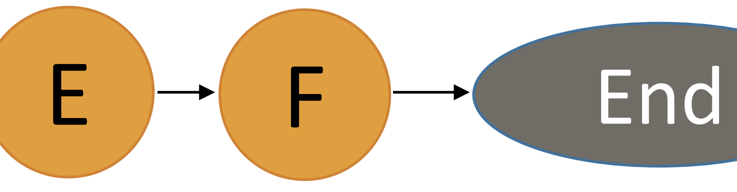




Start

A

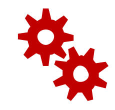












6.4 Estimate Activity Durations

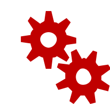
Legend:
New Item
Already Explained Item



Inputs, Tools & Techniques, and Outputs

Inputs		Tools & Techniques		Outputs	
Project management plan (Schedule management plan)	7	Expert judgment	35	Duration estimates	1
Project management plan (Scope baseline)	16	Analogous estimating	3	Basis of estimates	3
Project documents (Activity attributes)	4	Parametric estimating	3	Project documents updates (Activity attributes)	4
Project documents (Activity list)	4	Three-point estimating	2	Project documents updates (Assumption log)	17
Project documents (Assumption log)	14	Bottom-up estimating	3	Project documents updates (Lessons learned register)	29
Project documents (Lessons learned register)	27	Data analysis (Alternatives analysis)	13		
Project documents (Milestone list)	9	Data analysis (Reserve analysis)	5		
Project documents (Project team assignments)	7	Decision making (Voting)	7		
Project documents (Resource breakdown structure)	3	Meetings	28		
Project documents (Resource calendars)	7				
Project documents (Resource requirements)	8				
Project documents (Risk register)	22				
Enterprise environmental factors	40				
Organizational process assets	47				

CORRECTION



6.4 Estimate Activity Durations



Data Flow Diagrams

Project Management Plan

Project management plan
- Schedule management plan
- Scope baseline

Project Documents

Project documents
- Activity attributes
- Activity list
- Assumption log
- Lessons learned register
- Milestone list
- Project team assignments
- Resource breakdown structure
- Resource calendars
- Resource requirements
- Risk register

Enterprise/ Organization

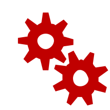
- Enterprise environmental factors
- Organizational process assets

6.4 Estimate Activity Durations

- Duration estimates
- Basis of estimates

Project Documents

Project document updates
- Activity attributes
- Assumption log
- Lessons learned register



6.4 Estimate Activity Durations Input



01 **Project management plan**

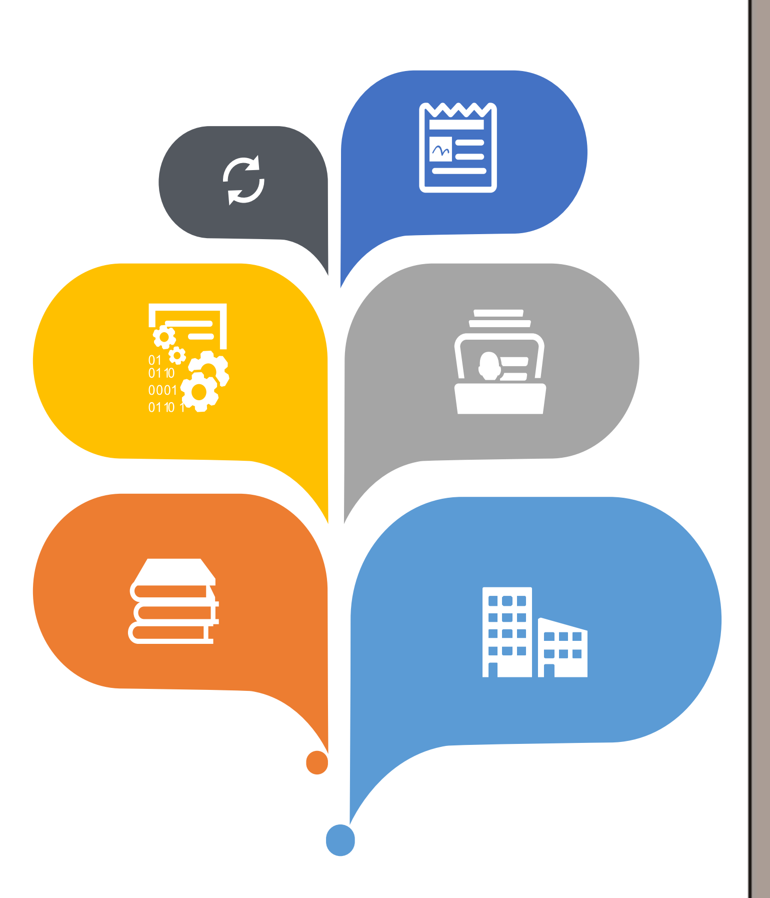
- Schedule management plan
- Scope baseline

02 **Project documents**

- Activity attributes
- Activity list
- Assumption log
- Lessons learned register
- Milestone list
- Risk register
- Project team assignments
- Resource breakdown structure
- Resource calendars
- Resource requirements

03 **Enterprise environmental factors**

04 **Organizational process assets**





6.4 Estimate Activity Durations Tools & Techniques



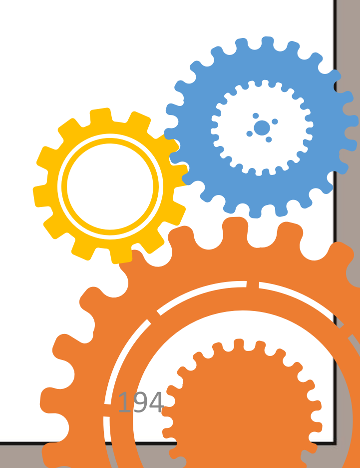
01 **Expert judgment**

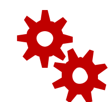
02 **Analogous estimating**

- A technique for estimating the duration or cost of an activity or a project using historical data from a similar activity or project.
- Less costly
- Less time
- Less accurate

03 **Parametric estimating**

- An estimating technique in which the duration is calculated based on historical data and project parameters.
- It uses a statistical relationship between historical data and other variables to calculate an estimate for activity parameters.
- Provide higher level of accuracy compared with analogous estimating technique





6.4 Estimate Activity Durations   Tools & Techniques



04 Three-point estimating

The accuracy of single-point activity duration estimates may be improved by considering estimation uncertainty and risk.

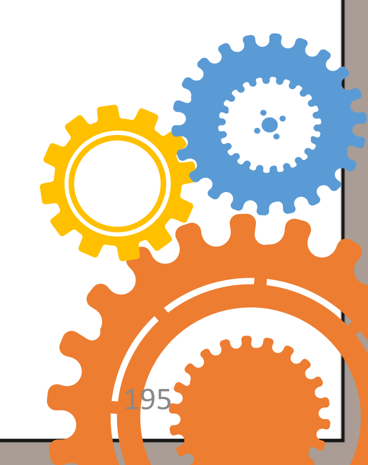
- Triangular distributions. used when there is insufficient historical data or when using judgmental data

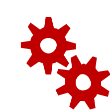
$$E = (O + M + P)/ 3$$

Optimistic (*tO*) - Most likely (*tM*) - Pessimistic (*tP*)

Standard Deviation = (tP - tO) / 6

- Activity standard deviation is the possible range for the estimate.





6.4 Estimate Activity Durations   Tools & Techniques



05 **Bottom-up estimating**

estimating project duration by aggregating the estimates of the lower-level components of the WBS

06 **Data analysis (Alternatives analysis)**

07 **Data analysis (Reserve analysis)**

Determine the amount of contingency and management reserve needed for the project.

✓ Contingency reserves

- Associated with the known-unknowns that can affect a project.
- Contingency should be clearly identified in the schedule documentation.

✓ Management reserves

- Associated with the unknown-unknowns that can affect a project.
- Management reserve is not included in the schedule baseline, but it is part of the overall project duration requirements.

08 **Decision Making (Voting)**

09 **Meetings**



6.4 Estimate Activity Durations Output



01 **Duration Estimates**

- Number of time periods that are required to complete an activity, a phase, or a project.
- Duration estimates do not include any Lead or lags.
- May include some indication of the range of possible results.

02 **Basis of Estimates**

- Documentation of the basis of the estimate.
  - How it was developed - Assumptions made - Known constraints
  - Range of possible estimates (e.g., ±10%)
  - Indication of the confidence level of the final estimate
  - Project risks influencing this estimate.

03 **Project documents updates**

- Activity attributes
- Assumption log
- Lessons learned register





6.5 Develop Schedule

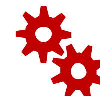


Legend:
New Item
Already Explained Item



Inputs, Tools & Techniques, and Outputs

Inputs		Tools & Techniques		Outputs	
Project management plan (Schedule management plan)	7	Schedule network analysis	1	Schedule baseline	1
Project management plan (Scope baseline)	16	Critical path method	2	Project schedule	1
Project documents (Activity attributes)	4	Resource optimization	2	Schedule data	1
Project documents (Activity list)	4	Data analysis (What-if scenario analysis)	2	Project calendars	1
Project documents (Assumption log)	14	Data analysis (Simulation)	2	Change requests	24
Project documents (Basis of estimates)	6	Leads and lags	3	Project management plan updates (Schedule management plan)	3
Project documents (Duration estimates)	3	Schedule compression	2	Project management plan updates (Cost baseline)	12
Project documents (Lessons learned register)	27	Project management information system	12	Project documents updates (Activity attributes)	4
Project documents (Milestone list)	9	Agile release planning	1	Project documents updates (Assumption log)	17
Project documents (Project schedule network diagrams)	1			Project documents updates (Duration estimates)	1
Project documents (Project team assignments)	7			Project documents updates (Lessons learned register)	29
Project documents (Resource calendars)	7			Project documents updates (Resource requirements)	3
Project documents (Resource requirements)	8			Project documents updates (Risk register)	23
Project documents (Risk register)	22				
Agreements	11				
Enterprise environmental factors	40				
Organizational process assets	47				



6.5 Develop Schedule



Data Flow Diagrams

Project Management Plan

Project management plan
- Schedule management plan
- Scope baseline

Project Documents

Project documents
- Activity attributes
- Activity list
- Assumption log
- Basis of estimates
- Duration estimates
- Lessons learned register
- Milestone list
- Project schedule network diagrams
- Project team assignments
- Resource calendars
- Resource requirements
- Risk register

12.2 Conduct Procurements

- Agreements

Enterprise/ Organization

- Enterprise environmental factors
- Organizational process assets

6.5 Develop Schedule

- Schedule baseline

Project Management Plan

Project management plan updates
- Schedule management plan
- Cost baseline

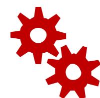
- Change requests

4.6 Perform Integrated Change Control

- Project schedule
- Schedule data
- Project calendars

Project Documents

Project documents updates
- Activity attributes
- Assumption log
- Duration estimates
- Lessons learned register
- Resource requirements
- Risk register



6.5 Develop Schedule Input



01 **Project management plan**
- Schedule management plan
- Scope baseline

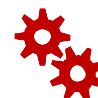
02 **Project documents**
- Activity attributes
- Activity list
- Assumption log
- Basis of estimates
- Duration estimates
- Lessons learned register
- Milestone list
- Project schedule network diagrams
- Project team assignments
- Resource calendars
- Resource requirements
- Risk register

03 **Agreements**

04 **Enterprise environmental factors**

05 **Organizational process assets**





6.5 Develop Schedule Tools & Techniques

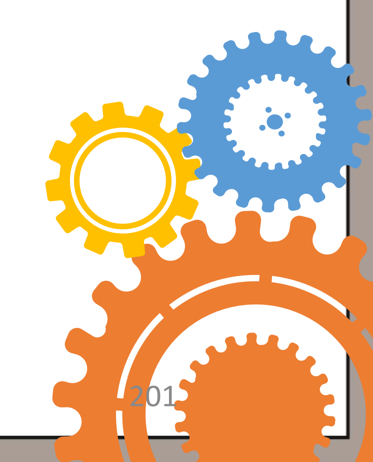


01 **SCHEDULE NETWORK ANALYSIS**

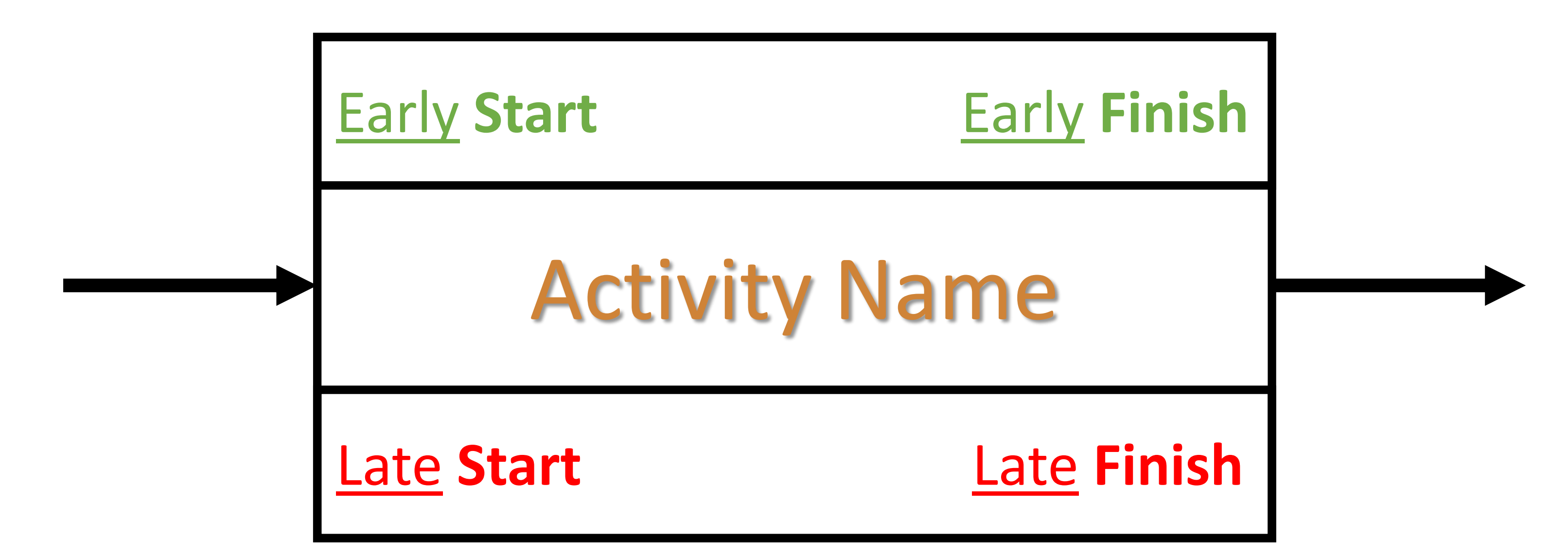
A technique to **identify** early and late start dates, as well as early and late finish dates, for the uncompleted portions of project activities.

02 **CRITICAL PATH METHOD**

- Critical path is the sequence of activities that represents the longest path through a project. Determines the shortest possible project duration
- Characterized by zero total float.
- Schedule networks may have multiple near-critical paths.




IPMC


Duration
Early Start
Early Finish
Activity Name
Late Start
Late Finish
Total Float



Schedule Network Analysis

Earliest start & finish

Latest start & finish

DUR =15
11 F 25
26 F 40
TF = 15

DUR =5
36 G 40
41 G 45
TF = 5

DUR =10
1 A 10
1 A 10
DRAG= 10

DUR =20
11 B 30
11 B 30
DRAG= 15

DUR =5
31 C 35
31 C 35
DRAG= 5

DUR =10
36 D 45
36 D 45
DRAG= 5

DUR =20
46 E 65
46 E 65
DRAG= 20

DUR =15
11 H 25
31 H 45
TF = 20

TF = total float

= critical path

DRAG= delay amount

Schedule Network Analysis



Start → A

A: Duration 5 Days

??	??
A	
??	??

Total Float =

A → B, A → C

B: 5 Days

??	??
B	
??	??

TF =

C: 10 Days

??	??
C	
??	??

TF =

B → D, C → D

D: 15 Days

??	??
D	
??	??

TF =

D → Finish

Schedule Network Analysis



Start

Duration 5 Days

1	5
A	
1	5

Total Float = 0

5 Days

6	10
B	
11	15

TF = 5

10 Days

6	15
C	
6	15

TF = 0

15 Days

16	30
D	
16	30

TF = 0

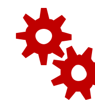
Finish

TF = LS – ES

LF – EF

Critical Path

Non Critical Path



6.5 Develop Schedule Tools & Techniques



Activity	Early Start	Duration	Early Finish	Late Start	Total Float	Late Finish
A	1	5	5	1	0	5
B	6	5	10	11	5	15
C	6	10	15	6	0	15
D	16	15	30	16	0	30

Start → A → B → D → Finish; A → C → D

Path A-B-D = 25

Path A-C-D = 30
(Critical Path)

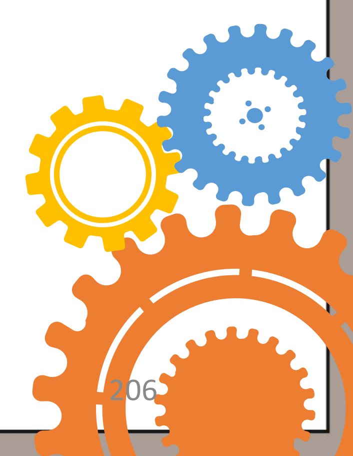
KEY Activity Node

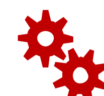
Early Start	Duration	Early Finish
Activity Name		
Late Start	Total Float	Late Finish

Critical Path Link

Non-Critical Path Link

NOTE: This example uses the accepted convention of the project starting on day 1 for calculating start and finish dates. There are other accepted conventions that may be used.





6.5 Develop Schedule Tools & Techniques



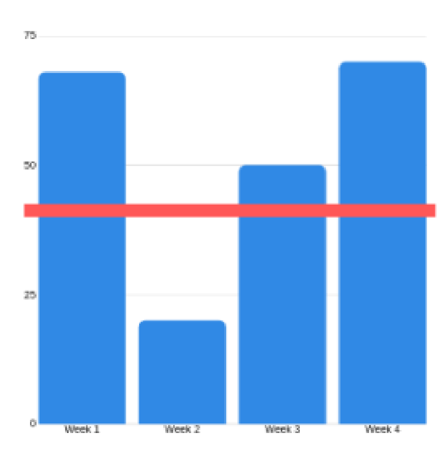


RESOURCE OPTIMIZATION

used to adjust the start and finish dates of activities to **adjust planned resource use** to be equal to or less than resource availability.

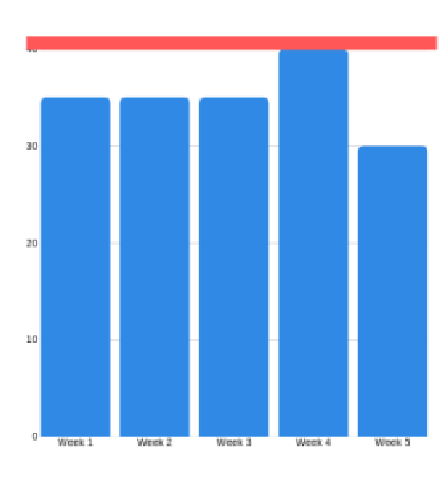
Resource leveling

- A technique in which start and finish dates are **adjusted** based on **resource constraints**.
- A way to fix resource over allocation.
- Critical path may change.



Resource Smoothing

- A technique that **adjusts** the activities of a schedule model **to solve utilization**.
- Critical path is not changed and the completion date may not be delayed.
- Activities may be delayed within their free and total float.





6.5 Develop Schedule   Tools & Techniques



Activities Before Resource Leveling

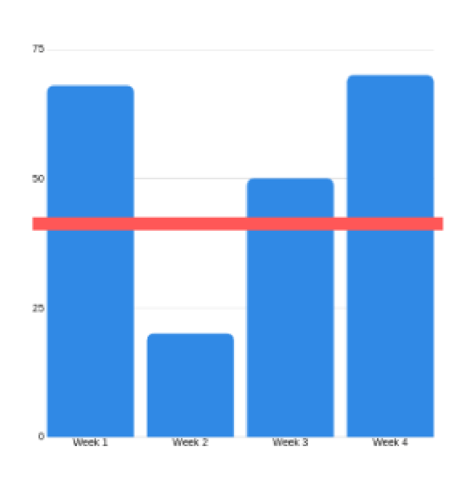
Start → Activity A (Tom: 8 hrs, Sue: 8 hrs)
Start → Activity B (Sue: 8 hrs)
Activity A, Activity B → Activity C (Tom: 8 hrs) →

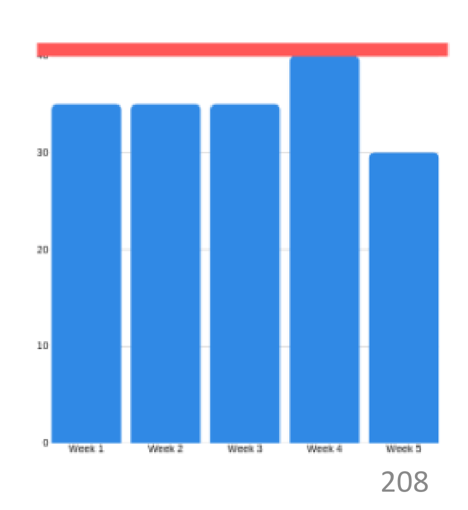
Day 1	Day 2	Day 3
Tom: 8 hrs Sue: 16 hrs	Tom: 8 hrs	

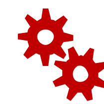
Activities After Resource Leveling

Start → Activity A (Tom: 8 hrs, Sue: 8 hrs)
Start → Activity B (Sue: 8 hrs)
Activity A, Activity B → Activity C (Tom: 8 hrs) →

Day 1	Day 2	Day 3
Tom: 8 hrs Sue: 8 hrs	Sue: 8 hrs	Tom: 8 hrs







6.5 Develop Schedule   Tools & Techniques



04 DATA ANALYSIS

❖ What-If Scenario Analysis:

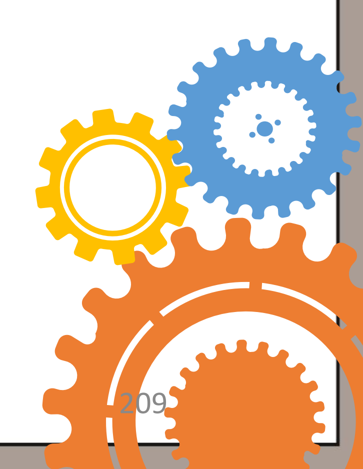
Evaluating scenarios in order to predict their effect positively or negatively on project objectives.

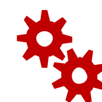
❖ Simulation:

Calculating multiple project durations with different sets of activity assumptions, usually using probability distributions constructed from the three-point estimates to account for uncertainty.

The most common simulation technique is **Monte Carlo analysis** it used to calculate possible schedule outcomes for the total project based on 3-point estimates for each activity on network diagram.

05 LEADS AND LAGS





6.5 Develop Schedule   Tools & Techniques



06 **SCHEDULE COMPRESSION**

Shorten the schedule duration without reducing the project scope, in order to meet schedule constraints, imposed dates, or other schedule objectives

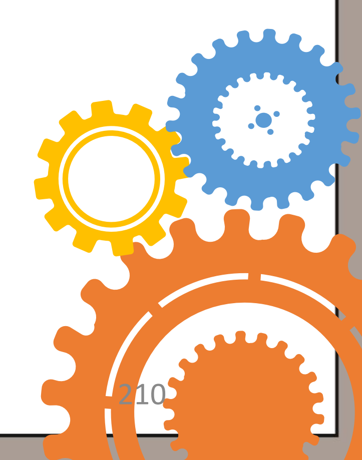
- **Crashing:**

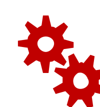
A technique used to shorten the schedule duration by adding resources (increase cost)

- **Fast tracking:**

Activities or phases normally done in sequence are performed in parallel (increase Risk).

07 **PROJECT MANAGEMENT INFORMATION SYSTEM (PMIS)**

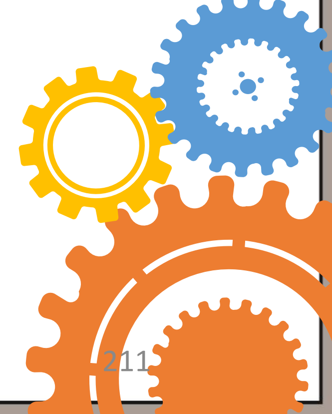


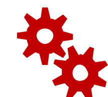


6.5 Develop Schedule

Tools & Techniques







6.5 Develop Schedule   Tools & Techniques



08 AGILE RELEASE PLANNING

Provides a high-level summary timeline of the release schedule (typically 3 to 6 months) based on the product roadmap.

Determines the number of iterations or sprints in the release.

Release 1
Release 2
Release 3

Release Plan

Iteration 0
Iteration 1
Iteration 2
Iteration 3
Iteration *n*

Iteration Plan

Feature A (User Story 1)
Feature A (User Story 2)
Feature B (User Story 3)
Feature C (User Story 4)
Feature D (User Story 5)

Task A	5 Hours
Task B	8 Hours
Task C	4 Hours
Task D	12 Hours

6.5 Develop Schedule Output



01 **Schedule Baseline**

The approved version of a schedule model that can be changed only through formal change control procedures and used as a basis for comparison to actual results. Accepted & approved by the appropriate stakeholders.

02 **Project Schedule**

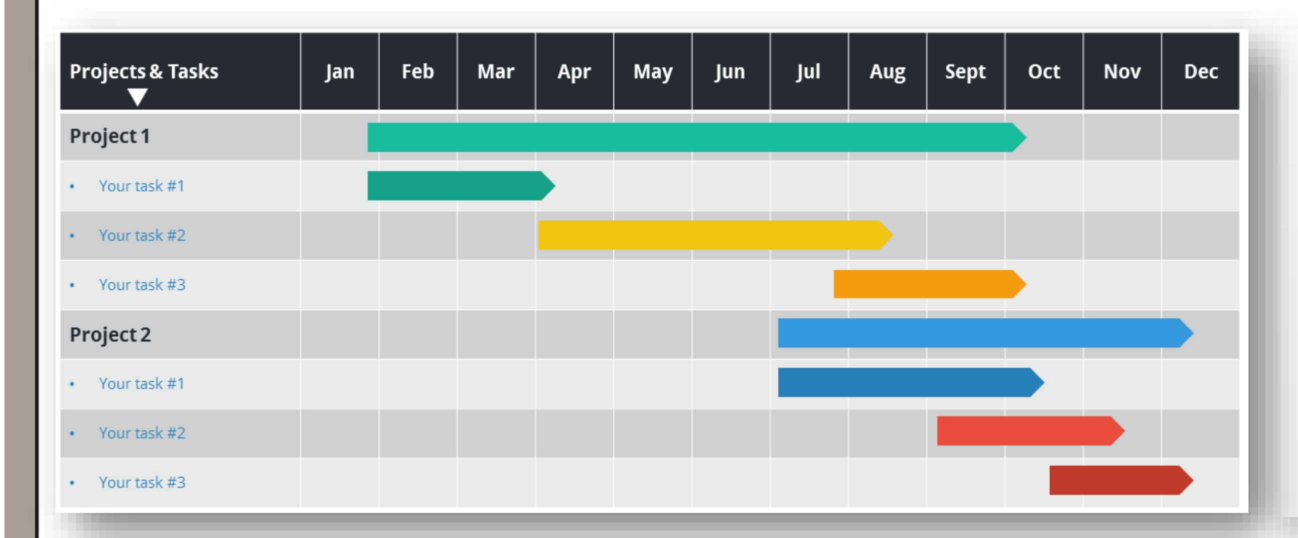
presents linked activities, detailed or summary with planned dates, durations, milestones, and resources.

It can be presented in tabular form using below formats:

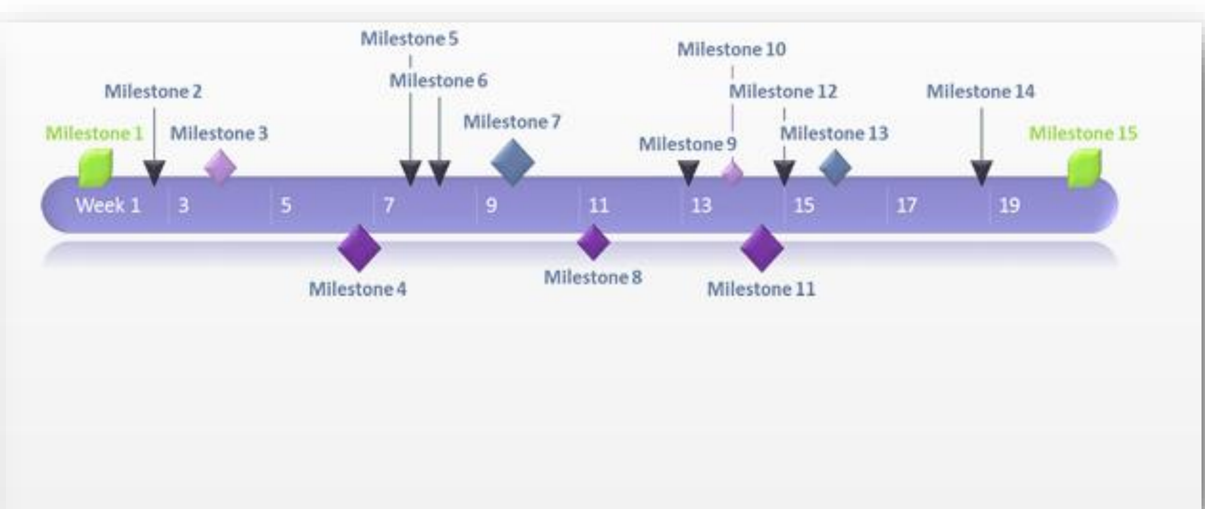
- **Bar charts** (Gantt charts)
- **Milestone charts**
- **Project schedule network diagrams** (logical diagram) presented in the activity-on-node diagram format showing activities and relationships without a time scale,



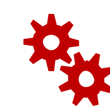




Bar charts (Gantt charts)



Milestone charts



6.5 Develop Schedule Output



03 **Schedule Data**

The collection of information for describing and controlling the schedule. Includes (milestones, schedule activities, activity attributes, and documentation of all identified assumptions & constraints)

04 **Project calendar**

Identifies working days and shifts that are available for scheduled activities. In addition to the project team members vacations. The project calendars may be updated as required.

05 **Change requests**

06 **Project management plan updates**

07 **Project documents updates**



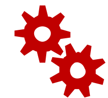


Legend:
New Item
Already Explained Item



Inputs, Tools & Techniques, and Outputs

Inputs		Tools & Techniques		Outputs	
Project management plan (Schedule management plan)	7	Data analysis (Earned value analysis)	4	Work performance information	10
Project management plan (Schedule baseline)	5	Data analysis (Iteration burndown chart)	1	Schedule forecasts	1
Project management plan (Scope baseline)	16	Data analysis (Performance reviews)	4	Change requests	24
Project management plan (Performance measurement baseline)	3	Data analysis (Trend analysis)	7	Project management plan updates (Schedule management plan)	3
Project documents (Lessons learned register)	27	Data analysis (Variance analysis)	5	Project management plan updates (Schedule baseline)	9
Project documents (Project calendars)	1	Data analysis (What-if scenario analysis)	2	Project management plan updates (Cost baseline)	12
Project documents (Project schedule)	11	Critical path method	2	Project management plan updates (Performance measurement baseline)	3
Project documents (Resource calendars)	7	Project management information system	12	Project documents updates (Assumption log)	17
Project documents (Schedule data)	1	Resource optimization	2	Project documents updates (Basis of estimates)	2
Work performance data	10	Leads and lags	3	Project documents updates (Lessons learned register)	29
Organizational process assets	47	Schedule compression	2	Project documents updates (Project schedule)	7
				Project documents updates (Resource calendars)	3
				Project documents updates (Risk register)	23
				Project documents updates (Schedule data)	1



6.6 Control Schedule



Data Flow Diagrams

Project Management Plan

Project management plan
- Schedule management plan
- Schedule baseline
- Scope baseline
- Performance measurement baseline

Project Documents

Project documents
- Lessons learned register
- Project calendars
- Project schedule
- Resource calendars
- Schedule data

4.3 Direct and Manage Project Work

- Work performance data

Enterprise/ Organization

- Organizational process assets

6.6 Control Schedule

4.5 Monitor and Control Project Work

- Work performance information

4.6 Perform Integrated Change Control

- Change requests

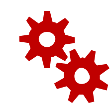
Project Management Plan

Project management plan updates
- Schedule management plan
- Schedule baseline
- Cost baseline
- Performance measurement baseline

Project Documents

- Schedule forecasts

Project documents updates
- Assumption log
- Basis of estimates
- Lessons learned register
- Project schedule
- Resource calendars
- Risk register
- Schedule data



6.6 Control Schedule Input



01 **Project management plan**
- Schedule management plan
- Schedule baseline
- Scope baseline
- Performance measurement baseline

02 **Project documents**
- Lessons learned register
- Project calendars
- Project schedule
- Resource calendars
- Schedule data

03 **Enterprise environmental factors**

04 **Organizational process assets**





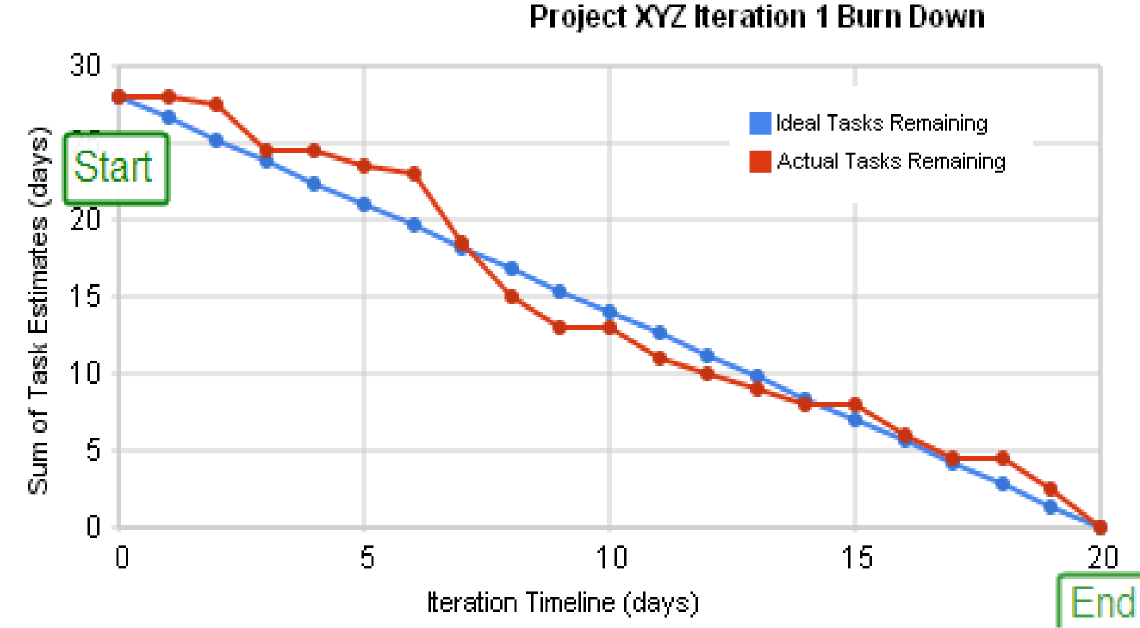
6.6 Control Schedule

Tools & Techniques



01 DATA ANALYSIS

- **Earned value analysis (cost part)**
- **Iteration burndown chart** This chart tracks the work that remains to be completed in the iteration backlog.
- **Performance reviews** compare, and analyze schedule performance against the schedule baseline



02 Critical Path Method

03 Project Management Information System

04 Resource Optimization

05 Leads And Lags

06 Schedule Compression



6.6 Control Schedule   Output



01 **Work performance information**

02 **Schedule forecasts**
are estimates or predictions of conditions and events in the project's future based on information and knowledge available at the time of the forecast.

03 **Change requests**

04 **Project management plan updates**
- Schedule management plan
- Performance measurement baseline

05 **Project documents updates**





7. PROJECT COST MANAGEMENT



Presented by :
Abdulfattah Ajlan
Certified PMP Trainer

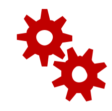


Project Cost Management

Project Cost Management includes the processes involved in planning, estimating, budgeting, financing, funding, managing, and controlling **costs** so that the project can be completed within the approved budget



Knowledge Areas	Project Management Process Groups				
	Initiating	Planning	Executing	Monitoring and Controlling	Closing
Project Integration Management	4.1 Develop Project Charter	4.2 Develop Project Management Plan	4.3 Direct and Manage Project Work 4.4 Manage Project Knowledge	4.5 Monitor and Control Project Work 4.6 Perform Integrated Change Control	4.7 Close Project
Project Scope Management		5.1 Plan Scope Management 5.2 Collect Requirements 5.3 Define Scope 5.4 Create WBS		5.5 Validate Scope 5.6 Control Scope	
Project Schedule Management		6.1 Plan Schedule 6.2 Define Activities 6.3 Sequence Activities 6.4 Estimate Activity Durations 6.5 Develop Schedule Management		6.6 Control Schedule	
Project Cost Management		7.1 Plan Cost Management 7.2 Estimate Costs 7.3 Determine Budge		7.4 Control Costs	
Project Quality Management		8.1 Plan Quality Management	8.2 Manage Quality	8.3 Control Quality	
Project Resource Management		9.1 Plan Resource Management 9.2 Estimate Activity Resources	9.3 Acquire Resources 9.4 Develop Team 9.5 Manage Team	9.6 Control Resources	
Project Communications Management		10.1 Plan Communications Management	10.2 Manage Communications	10.3 Monitor Communications	
Project Risk Management		11.1 Plan Risk Management 11.2 Identify Risks 11.3 Perform Qualitative Risk Analysis 11.4 Perform Quantitative Risk Analysis 11.5 Plan Risk Responses	11.6 Implement Risk Responses	11.7 Monitor Risks	
Project Procurement Management		12.1 Plan Procurement Management	12.2 Conduct Procurements	12.3 Control Procurements	
Project Stakeholder Management	13.1 Identify Stakeholders	13.2 Plan Stakeholder Engagement	13.3 Manage Stakeholder Engagement	13.4 Monitor Stakeholder Engagement	



7.1 Plan Cost Management

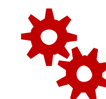
Legend:
New Item
Already Explained Item



Inputs, Tools & Techniques, and Outputs

Inputs		Tools & Techniques		Outputs	
Project charter	14	Expert judgment	35	Cost management plan	1
Project management plan (Schedule management plan)	7	Data analysis (Alternatives analysis)	13		
Project management plan (Risk management plan)	12	Meetings	28		
Enterprise environmental factors	40				
Organizational process assets	47				





7.1 Plan Cost Management



Data Flow Diagrams

4.1
Develop Project
Charter

• Project charter

Project
Management
Plan

Project management plan
• Schedule management plan
• Risk management plan

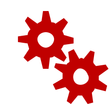
Enterprise/
Organization

• Enterprise environmental factors
• Organizational process assets

7.1
Plan Cost
Management

• Cost management plan

Project
Management
Plan



7.1 Plan Cost Management Input



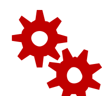
01 **PROJECT CHARTER**

02 **PROJECT MANAGEMENT PLAN**

03 **ENTERPRISE ENVIRONMENTAL FACTORS**

04 **ORGANIZATIONAL PROCESS ASSETS**





7.1 Plan Cost Management   Tools & Techniques



01 **Expert judgment**

02 **Data analysis** (Alternatives analysis)

03 **Meetings**



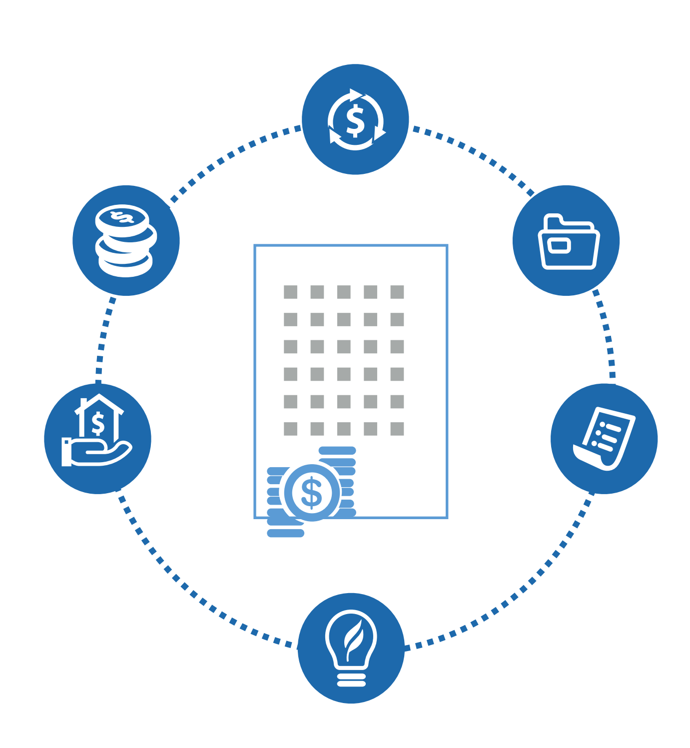
7.1 Plan Cost Management Output

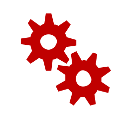


01 Cost management plan

Describes how the project costs will be planned, structured, and controlled.

- **Units of measure.**
- **Level of precision.** rounded up or down.
- **Level of accuracy.** The acceptable range (e.g., ±10%).
- **Organizational procedures links.** Each control account is assigned a unique code or account number(s) that links directly to the performing organization's accounting system.
- **Control thresholds.** the percentage deviations from the baseline plan.
- **Rules of performance measurement.** EVM rules
- **Reporting formats.** The formats and frequency for cost reports.





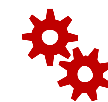
7.2 Estimate Costs

Legend:
New Item
Already Explained Item



Inputs, Tools & Techniques, and Outputs

Inputs		Tools & Techniques		Outputs	
Project management plan (Cost management plan)	4	Expert judgment	35	Cost estimates	1
Project management plan (Quality management plan)	7	Analogous estimating	3	Basis of estimates	3
Project management plan (Scope baseline)	16	Parametric estimating	3	Project documents updates (Assumption log)	17
Project documents (Lessons learned register)	27	Bottom-up estimating	3	Project documents updates (Lessons learned register)	29
Project documents (Project schedule)	11	Three-point estimating	2	Project documents updates (Risk register)	23
Project documents (Resource requirements)	8	Data analysis (Alternatives analysis)	13		
Project documents (Risk register)	22	Data analysis (Reserve analysis)	5		
Enterprise environmental factors	40	Data analysis (Cost of quality)	2		
Organizational process assets	47	Project management information system	12		
		Decision making (Voting)	7		



7.2 Estimate Costs



Data Flow Diagrams

Project Management Plan

Project management plan
- Cost management plan
- Quality management plan
- Scope baseline

Project Documents

Project documents
- Lessons learned register
- Project schedule
- Resources requirements
- Risk register

Enterprise/ Organization

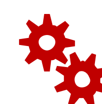
- Enterprise environmental factors
- Organizational process assets

7.2 Estimate Costs

- Cost estimates
- Basis of estimates

Project Documents

Project documents updates
- Assumption log
- Lessons learned register
- Risk register



7.2 Estimate Costs Input



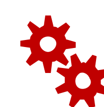
01 **PROJECT MANAGEMENT PLAN**

02 **PROJECT DOCUMENTS**

03 **ENTERPRISE ENVIRONMENTAL FACTORS**

04 **ORGANIZATIONAL PROCESS ASSETS**





7.2 Estimate Costs Tools & Techniques



01 **Expert Judgment**

02 **Analogous Estimating**

03 **Parametric Estimating**

04 **Bottom-up Estimating**

05 **Three-point Estimating**

06 **PMIS**

07 **Decision Making**

08 **Data Analysis**

- Alternatives Analysis

- Reserve Analysis

- Cost Of Quality. (Prevention costs - Appraisal costs - Failure costs)



7.2 Estimate Costs Output



01 **COST ESTIMATES**

Include quantitative assessments of the costs required to complete project work, as well as contingency amounts to account for identified risks, and management reserve to cover unplanned work.

- **Direct cost** : labor, materials, equipment, information technology, Etc.
- **Indirect costs**: can be included at the activity level or at higher levels.

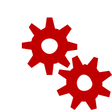
02 **BASIS OF ESTIMATES**

should provide a clear and complete understanding of how the cost estimate was derived.

03 **PROJECT DOCUMENTS UPDATES**

Assumption log - Lessons learned register - Risk register





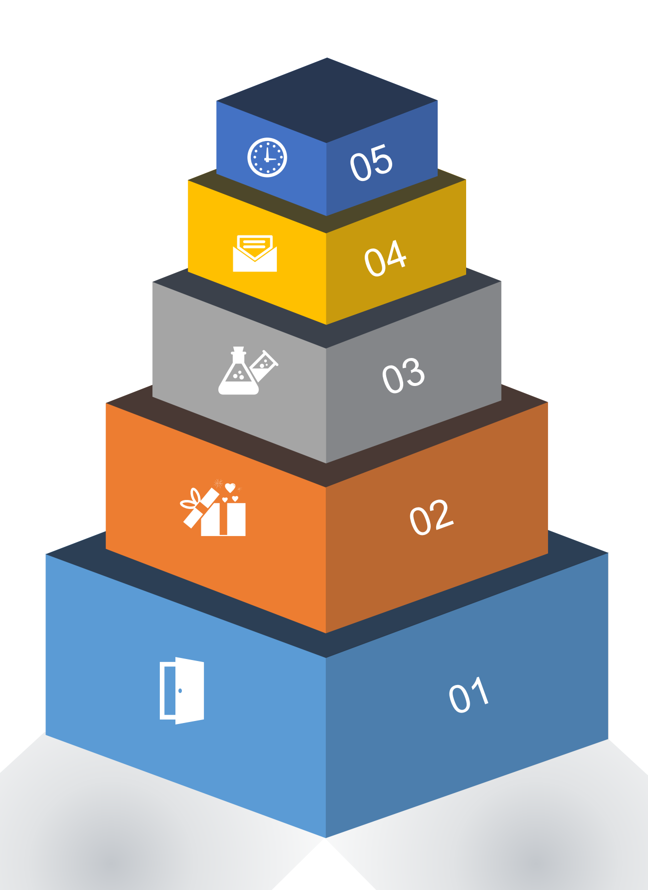
7.3 Determine Budget

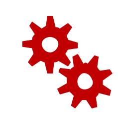




A project budget includes all the funds authorized to execute the project.

The **cost baseline** is the approved version of the time-phased project budget that **includes** contingency reserves, but **excludes** management reserves.





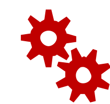
7.3 Determine Budget

Legend:
New Item
Already Explained Item



Inputs, Tools & Techniques, and Outputs

Inputs		Tools & Techniques		Outputs	
Project management plan (Cost management plan)	4	Expert judgment	35	Cost baseline	1
Project management plan (Resource management plan)	14	Cost aggregation	1	Project funding requirements	1
Project management plan (Scope baseline)	16	Data analysis (Reserve analysis)	5	Project documents updates (Cost estimates)	2
Project documents (Basis of estimates)	6	Historical information review	1	Project documents updates (Project schedule)	7
Project documents (Cost estimates)	4	Funding limit reconciliation	1	Project documents updates (Risk register)	23
Project documents (Project schedule)	11	Financing	1		
Project documents (Risk register)	22				
Business documents (Business case)	6				
Business documents (Benefits management plan)	5				
Agreements	11				
Enterprise environmental factors	40				
Organizational process assets	47				



7.3 Determine Budget



Data Flow Diagrams

Project Management Plan

Project management plan
- Cost management plan
- Resource management plan
- Scope baseline

Project Documents

Project documents
- Basis of estimates
- Cost estimates
- Project schedule
- Risk register

Business Documents

- Business case
- Benefits management plan

12.2 Conduct Procurements

- Agreements

Enterprise/ Organization

- Enterprise environmental factors
- Organizational process assets

7.3 Determine Budget

Project Management Plan

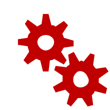
- Cost baseline

7.4 Control Costs

- Project funding requirements

Project Documents

Project documents updates
- Cost estimates
- Project schedule
- Risk register



7.3 Determine Budget Input



01 **Project management plan**

Cost management plan - Resource management plan - Scope baseline

02 **Project documents**

Basis of estimates - Cost estimates - Project schedule - Risk register

03 **Business documents**

Business case - Benefits management plan

04 **Agreements**

05 **Enterprise environmental factors**

06 **Organizational process assets**





7.3 Determine Budget Tools & Techniques



01 **EXPERT JUDGMENT**

02 **COST AGGREGATION**

Aggregate the cost estimate for work package, then aggregated for the higher component levels of the WBS (such as control accounts) and, ultimately, for the entire project.

03 **DATA ANALYSIS**

04 **HISTORICAL INFORMATION REVIEW**

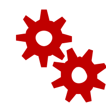
Assist in developing parametric estimates or analogous estimates.

05 **FUNDING LIMIT RECONCILIATION**

The expenditure of funds should be reconciled with any funding limits on the commitment of funds for the project.

06 **FINANCING**: Financing entails acquiring funding for projects. the funding entity may have certain requirements that are required to be met.





7.3 Determine Budget Tools & Techniques



Cost Aggregation

- Project
  - Phase1
    - Deliverable 1.1
      - Work Pkg 1.1.1
      - Work Pkg 1.1.2
      - Work Pkg 1.1.3
    - Deliverable 1.2
      - Work Pkg 1.2.1
      - Work Pkg 1.2.2
  - Phase2
  - Phase3
    - Deliverable 3.1
      - Work Pkg 3.1.1
      - Work Pkg 3.1.2
      - Work Pkg 3.1.3



7.3 Determine Budget Output



01 COST BASELINE

It is the approved version of the project budget, **excluding** any management reserves, Can only be changed through formal change control procedures.

02 PROJECT FUNDING REQUIREMENTS

- ✓ Total funding requirements and periodic funding requirements (e.g., monthly, quarterly, annually) are derived from the cost baseline.
- ✓ Total funds required are those included in the cost baseline plus management reserves

03 PROJECT DOCUMENTS UPDATES

Cost estimates - Project schedule - Risk register





Total Amount

Project Budget

Management Reserve

Cost Baseline

Control Accounts

Contingency Reserve

Work Package Cost Estimates

Activity Contingency Reserve

Activity Cost Estimates

Project Budget Component



7.4 Control Costs

Legend:
New Item
Already Explained Item



Inputs, Tools & Techniques, and Outputs

Inputs		Tools & Techniques		Outputs	
Project management plan (Cost management plan)	4	Expert judgment	35	Work performance information	10
Project management plan (Cost baseline)	7	Data analysis (Earned value analysis)	4	Cost forecasts	1
Project management plan (Performance measurement baseline)	3	Data analysis (Variance analysis)	5	Change requests	24
Project documents (Lessons learned register)	27	Data analysis (Trend analysis)	7	Project management plan updates (Cost management plan)	2
Project funding requirements	1	Data analysis (Reserve analysis)	5	Project management plan updates (Cost baseline)	12
Work performance data	10	To-complete performance index	1	Project management plan updates (Performance measurement baseline)	3
Organizational process assets	47	Project management information system	12	Project documents updates (Assumption log)	17
				Project documents updates (Basis of estimates)	2
				Project documents updates (Cost estimates)	2
				Project documents updates (Lessons learned register)	29
				Project documents updates (Risk register)	23



7.4 Control Costs



Data Flow Diagrams

Project Management Plan

Project management plan
- Cost management plan
- Cost baseline
- Performance measurement baseline

Project Documents

- Lessons learned register

7.3 Determine Budget

- Project funding requirements

4.3 Direct and Manage Project Work

- Work performance data

Enterprise/ Organization

- Organizational process assets

7.4 Control Costs

4.5 Monitor and Control Project Work

- Work performance information

4.6 Perform Integrated Change Control

- Change requests

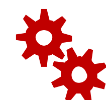
Project Management Plan

Project management plan updates
- Cost management plan
- Cost baseline
- Performance measurement baseline

- Cost forecasts

Project Documents

Project documents updates
- Assumption log
- Basis of estimates
- Cost estimates
- Lessons learned register
- Risk register



7.4 Control Costs Input



01 **Project management plan**

- Cost management plan
- Cost baseline
- Performance measurement baseline

02 **Project documents**

- Lessons learned register

03 **Project funding requirements**

04 **Enterprise environmental factors**

05 **Organizational process assets**





01 EXPERT JUDGMENT

02 DATA ANALYSIS

- ✓ **Earned value analysis (EVA).** compares the performance measurement baseline to the actual schedule and cost performance.

Planned value (PV) # **Earned value (EV)** # **Actual cost (AC)**

❖ **Schedule variance (SV) :** **SV = EV – PV**

Positive = Ahead of Schedule / **Neutral** = On schedule / **Negative** = Behind Schedule

❖ **Cost variance (CV) :** **CV = EV – AC**

Positive = Under planned cost / **Neutral** = On planned cost / **Negative** = Over planned cost







7.4 Control Costs   Tools & Techniques



- **Schedule performance index (SPI)** is a measure of schedule efficiency expressed as the ratio of earned value to planned value. It measures how efficiently the project team is accomplishing the work.

SPI = EV / PV

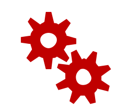
SPI < 1.0 indicates less work was completed than was planned.
SPI > 1.0 indicates that more work was completed than was planned.
SPI = Neutral indicates on schedule

- **Cost performance index (CPI)** is a measure of the cost efficiency of budgeted resources,

CPI = EV / AC

CPI < 1.0 indicates a cost overrun
CPI > 1.0 indicates a cost underrun of performance to date.
CPI= Neutral indicates a cost on planned cost





7.4 Control Costs   Tools & Techniques



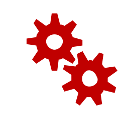
❖ **The cost variance at the end of the project** will be the difference between the **budget at completion (BAC)** and the actual amount spent.

VAC = BAC – EAC



(VAC) Variance at Completion
(BAC) Budget at Completion
(EAC) Estimate at Completion

- ✓ **Trend analysis** examines project performance over time to determine if performance is improving or deteriorating.
- ✓ **Reserve analysis**



7.4 Control Costs   Tools & Techniques



❖ **Forecasting**. the project team may develop a forecast **Estimate at Completion** (EAC) that may differ from the budget at completion **(BAC)** based on the project performance

1. If the CPI is expected to be the same for the remainder of the project,

EAC = BAC/CPI



2. If future work will be accomplished at the planned rate,

EAC = AC + BAC – EV

3. If the initial plan is no longer valid,

EAC = AC + Bottom-up ETC



4. If both the CPI and SPI influence the remaining work,

EAC = AC + [(BAC – EV)/(CPI x SPI)]



7.4 Control Costs — Tools & Techniques



03 TO-COMPLETE PERFORMANCE INDEX

A measure of the cost performance that must be achieved with the remaining resources in order to meet a specified management goal,

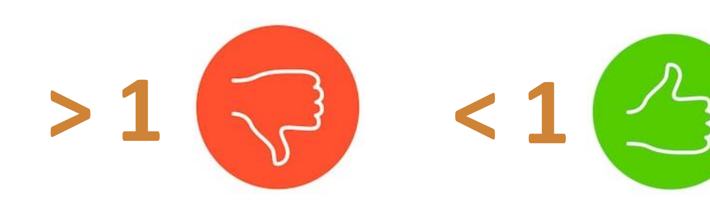
- The efficiency that must be maintained in order to complete on plan.

TCPI = (BAC – EV) / (BAC – AC)

- The efficiency that must be maintained in order to complete the current EAC.

TCPI = (EAC – EV) / (EAC – AC)

TCPI > 1.0 Harder to complete
TCPI = 1.0 Same to complete
TCPI <1 .0 Easier to complete





04 PROJECT MANAGEMENT INFORMATION SYSTEM (PMIS)



7.4 Control Costs Output



01 **Work performance information**

02 **Cost forecasts**

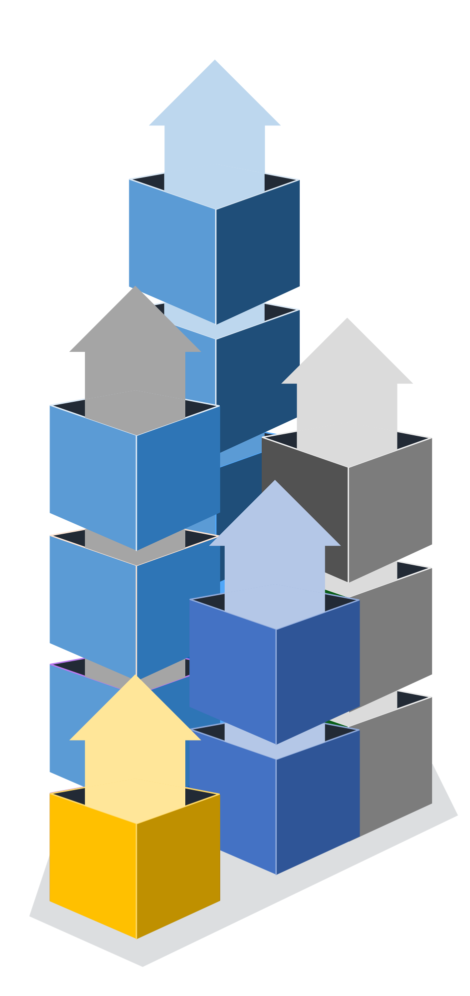
03 **Change requests**

04 **Project management plan updates**

- Cost management plan
- Cost baseline
- Performance measurement baseline

05 **Project documents updates**

- Assumption log
- Basis of estimates
- Cost estimates
- Lessons learned register
- Risk register





Exercise

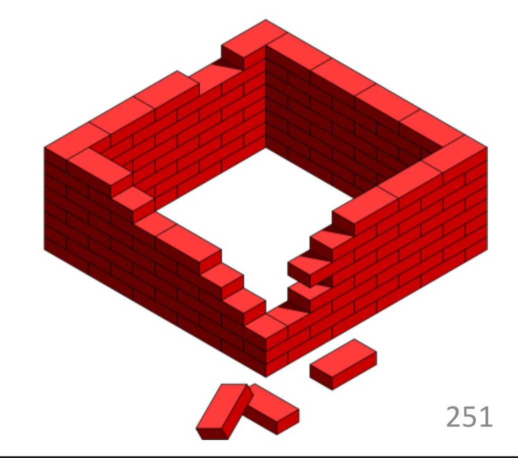


Earned Value Management

Assume 4 equal sides, budget 200$ per side, schedule 1 side per day. Finish 4 days & cost 800$.

Day1: side 1 complete, budget of 200$ spent.
Day2: side 2 started but not complete, Incurred cost for side 2 is 220$.
Day3: side 2 completed, and half of side 3 completed but team left early and only spent 140$

Where we are now? Ahead or Behind





Answer

PV ; EV ; AC ;

PV = 200 + 200 + 200 = 600

EV = 200 + 200 +100 = 500

AC = 200 + 220 + 140 = 560

CV= EV-AC

SV=EV-PV

CPI = EV/AC

SPI = EV/PV

EVM Example:



Earned Value Formulae

Name	Formulae	Value and Meaning
Cost Variance	CV=EV-AC	($200+$200+$100=$500) – ($200+$220+$140=$560) = **-$60**
Schedule Variance	SV=EV-PV	($200+$200+$100=$500) – ($200+$200+$200=$600)= **-$100**
Cost Performance Index	CPI=EV/AC	$500/$560 = **0.89**
Schedule Performance Index	SPI=EV/PV	$500/$600 = **0.83**
Estimate At Completion	EAC=BAC/CPI	$800/0.89 = **$900**
Estimate To Complete	ETC=EAC-AC	$900 - $560 = **$340**
Variance At Completion	BAC-EAC	$800-$900 = **-$100**



8. PROJECT QUALITY MANAGEMENT



Presented by :
Abdulfattah Ajlan
Certified PMP Trainer



Project Quality Management



Project Quality Management supports continuous process improvement activities as undertaken on behalf of the performing organization.

Quality: The degree to which a set of inherent characteristics **fulfill** requirements.

Differences between grade and quality

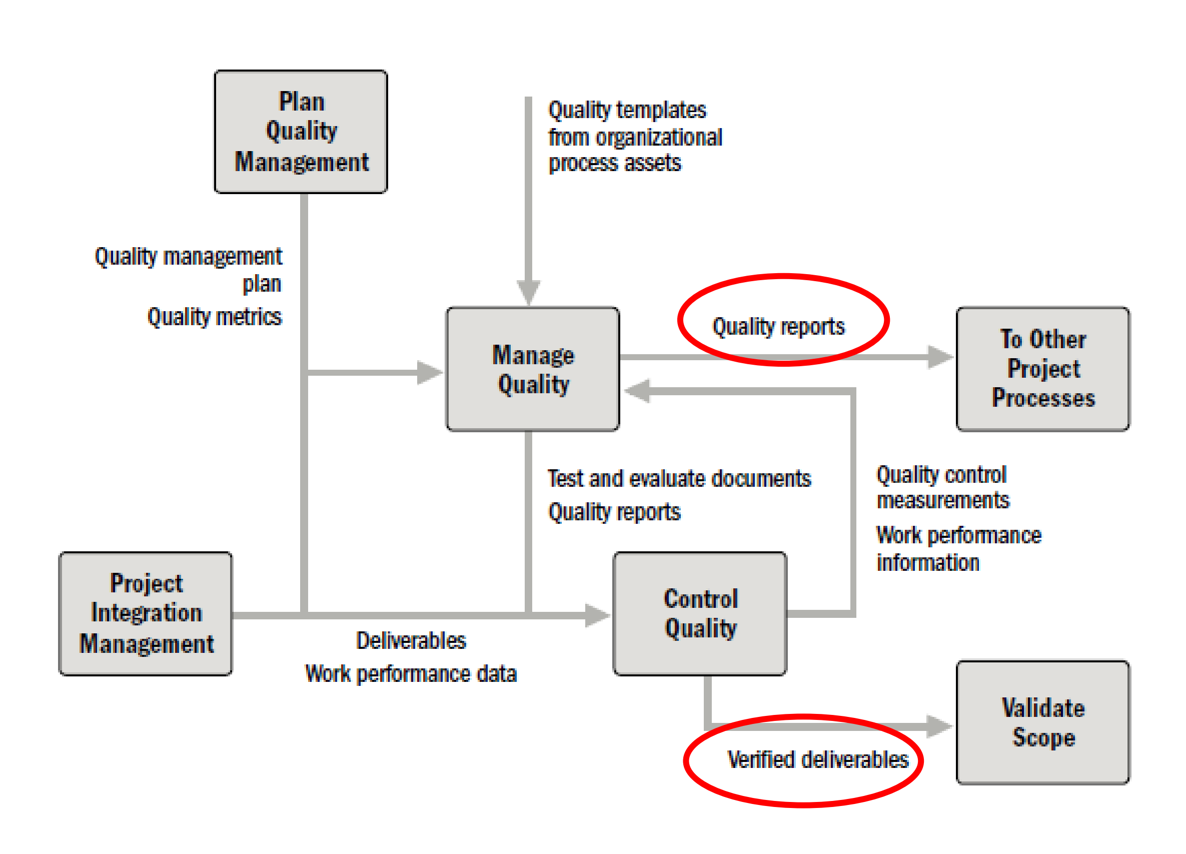
Quality: The degree of characteristics fulfill the requirements.
Grade: a category assigned to deliverables having the same functional use but different technical characteristics.

Knowledge Areas	Project Management Process Groups				
	Initiating	Planning	Executing	Monitoring and Controlling	Closing
Project Integration Management	4.1 Develop Project Charter	4.2 Develop Project Management Plan	4.3 Direct and Manage Project Work 4.4 Manage Project Knowledge	4.5 Monitor and Control Project Work 4.6 Perform Integrated Change Control	4.7 Close Project
Project Scope Management		5.1 Plan Scope Management 5.2 Collect Requirements 5.3 Define Scope 5.4 Create WBS		5.5 Validate Scope 5.6 Control Scope	
Project Schedule Management		6.1 Plan Schedule 6.2 Define Activities 6.3 Sequence Activities 6.4 Estimate Activity Durations 6.5 Develop Schedule Management		6.6 Control Schedule	
Project Cost Management		7.1 Plan Cost Management 7.2 Estimate Costs 7.3 Determine Budge		7.4 Control Costs	
Project Quality Management		8.1 Plan Quality Management	8.2 Manage Quality	8.3 Control Quality	
Project Resource Management		9.1 Plan Resource Management 9.2 Estimate Activity Resources	9.3 Acquire Resources 9.4 Develop Team 9.5 Manage Team	9.6 Control Resources	
Project Communications Management		10.1 Plan Communications Management	10.2 Manage Communications	10.3 Monitor Communications	
Project Risk Management		11.1 Plan Risk Management 11.2 Identify Risks 11.3 Perform Qualitative Risk Analysis 11.4 Perform Quantitative Risk Analysis 11.5 Plan Risk Responses	11.6 Implement Risk Responses	11.7 Monitor Risks	
Project Procurement Management		12.1 Plan Procurement Management	12.2 Conduct Procurements	12.3 Control Procurements	
Project Stakeholder Management	13.1 Identify Stakeholders	13.2 Plan Stakeholder Engagement	13.3 Manage Stakeholder Engagement	13.4 Monitor Stakeholder Engagement	

Quality Management Process Interrelations



- **Manage Quality** is concerned with managing the quality processes throughout the project.
- **Control Quality** is concerned with comparing the work results.
- There are two outputs specific to the Quality Knowledge Area that are used by other Knowledge Areas:
  - ❑ Verified deliverables.
  - ❑ Quality reports.



Key concepts for Project Quality Management



- **Project Quality Management** addresses the management of the project and it's deliverables. It applies to all projects, regardless of the nature of their deliverables.
- **Quality measures and techniques** are specific to the type of deliverables.
- **Prevention vs Inspection**.
  - **Prevention** (keeping errors out of the process)
  - **Inspection** (keeping errors out of the hands of the customer);



The **cost of preventing mistakes** is generally **much less** than the **cost of correcting mistakes**.

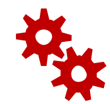
Key concepts for Project Quality Management



- **Attribute sampling:** it's a binary, it either conforms to quality or it doesn't (YES or NO).
- **Variable sampling:** Measures how well something conforms to quality (RANGES).
- **Tolerances:** specified range of acceptable results.
- **Control limits:** identify the boundaries of common variation in a statistically stable process or process performance.



- **Cost of quality (COQ):** all costs incurred over the life of the product by investment in **preventing** nonconformance to requirements, **appraising** the product or service for conformance to requirements.
- **Cost of poor quality:** categorized into **internal** (found by the project team) and **external** (found by the customer).



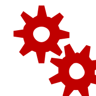
8.1 Plan Quality Management

Legend:
New Item
Already Explained Item



Inputs, Tools & Techniques, and Outputs

Inputs		Tools & Techniques		Outputs	
Project charter	14	Expert judgment	35	Quality management plan	1
Project management plan (Requirements management plan)	7	Data gathering (Benchmarking)	3	Quality metrics	1
Project management plan (Risk management plan)	12	Data gathering (Brainstorming)	6	Project management plan updates (Risk management plan)	4
Project management plan (Stakeholder engagement plan)	8	Data gathering (Interviews)	8	Project management plan updates (Scope baseline)	5
Project management plan (Scope baseline)	16	Data analysis (Cost-benefit analysis)	5	Project documents updates (Lessons learned register)	29
Project documents (Assumption log)	14	Data analysis (Cost of quality)	2	Project documents updates (Requirements traceability matrix)	7
Project documents (Requirements documentation)	13	Decision making (Multicriteria decision analysis)	8	Project documents updates (Risk register)	23
Project documents (Requirements traceability matrix)	7	Data representation (Flowcharts)	2	Project documents updates (Stakeholder register)	12
Project documents (Risk register)	22	Data representation (Logical data model)	1		
Project documents (Stakeholder register)	17	Data representation (Matrix diagrams)	2		
Enterprise environmental factors	40	Data representation (Mind mapping)	3		
Organizational process assets	47	Test and inspection planning	1		
		Meetings	28		



8.1 Plan Quality Management



Data Flow Diagrams

8.1 Plan Quality Management Input



01 **PROJECT CHARTER**

02 **PROJECT MANAGEMENT PLAN**

- Requirements management plan
- Risk management plan
- Stakeholder engagement plan
- Scope baseline

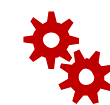
03 **PROJECT DOCUMENTS**

- Assumption log
- Requirements documentation
- Requirements traceability matrix
- Risk register
- Stakeholder register

04 **ENTERPRISE ENVIRONMENTAL FACTORS**

05 **ORGANIZATIONAL PROCESS ASSETS**





8.1 Plan Quality Management

Tools & Techniques

33 %

95 %

95 %



01 **EXPERT JUDGMENT**

02 **DATA GATHERING**

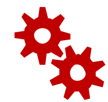
03 **DATA ANALYSIS**

Cost-benefit analysis

Is financial analysis tool used for estimate the strength and weakness of alternatives to determine the best alternative.

Cost of Quality.

- **Prevention costs:** Related to the prevention of poor quality in the deliverables.
- **Appraisal costs:** Related to evaluating, measuring, auditing, and testing the deliverables.
- **Failure costs (internal/external):** Related to nonconformance of the deliverables to the needs or expectations of the stakeholders.



8.1 Plan Quality Management

Tools & Techniques



Cost of Conformance

Prevention Costs
(Build a quality product)
- Training
- Document processes
- Equipment

Appraisal Costs
(Assess the quality)
- Testing
- Destructive testing loss
- Inspections

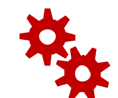
Money spent during the project
to avoid failures

Cost of Nonconformance

Internal Failure Costs
(Failures found by the project)
- Rework
- Scrap

External Failure Costs
(Failures found by the Customer)
- Liabilities
- Warranty work
- Lost business

Money spent during and after the project
because of failures



8.1 Plan Quality Management Tools & Techniques

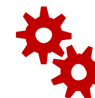


04 **DECISION MAKING** (Multicriteria decision analysis)

05 **DATA REPRESENTATION**

Flowcharts or Process maps because they display the sequence of steps and the branching possibilities that exist for a process that transforms one or more inputs into one or more outputs (Decision points).

- ✓ **SIPOC** (Suppliers, Inputs, Process, Outputs, and Customers) value chain model.
- ✓ **Process flows** or **process flow diagrams** When flowcharts used to represent steps in a process, and they can be used for process improvement as well as identifying where quality defects can occur or where to incorporate quality checks.



8.1 Plan Quality Management Tools & Techniques



Suppliers	Inputs	Process	Outputs	Customers
______	• ______	• ______	• ______	• ______
______	• ______	• ______	• ______	• ______
______	• ______	• ______	• ______	• ______
______	• ______	• ______	• ______	• ______

SUPPLIER → INPUT → PROCESS → OUTPUT → CUSTOMER

Requirements and Feedback Loop

Requirements and Feedback Loop

SIPOC value chain model.



8.1 Plan Quality Management Tools & Techniques



Sample Flowchart

Start

Step 1

Step 2

Step 3

Step 4

Step 5

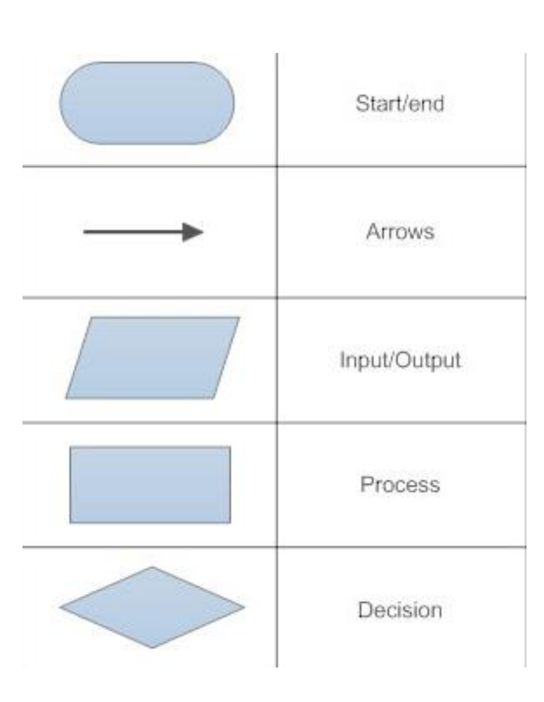
No

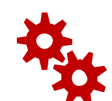
Yes

Step 6A

Step 6B

Stop





8.1 Plan Quality Management

Tools & Techniques

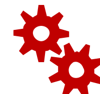


- **Logical data model.** Visual representation of an organization's data, described in business language and independent of any specific technology. used to identify where quality issues can arise.

- **Matrix diagrams.** Matrix diagrams help find the strength of relationships among different factors, causes, and objectives that exist between the rows and columns that form the matrix.
  It facilitate identifying the key quality metrics that are important for the success of the project.

- **Mind mapping** The mind-mapping technique may help in the rapid gathering of project quality requirements, constraints, dependencies, and relationships.

Learn to Learn
teachers
successes
failures
self assessment
peers
theory
©2013 g j huba phd



8.1 Plan Quality Management

Tools & Techniques



Branch

P	*	Branch_SID	INTEGER
	*	Branch_Name	VARCHAR2 (50)

Branch_PK (Branch_SID)

Vehicle

P	*	Vehicle_SID	INTEGER
	*	VIN	VARCHAR2 (16)
	*	Available_Indicator	CHAR (1 CHAR)
	*	Odometer	INTEGER
	*	Make	VARCHAR2 (25)
		Model	VARCHAR2 (25)
		Year	INTEGER
		Condition_Desc	VARCHAR2 (50)

Vehicle_PK (Vehicle_SID)

Rental

P	*	Rental_SID	INTEGER
		Pickup_Date	DATE
		Dropoff_Date	DATE
F	*	Vehicle_Vehicle_SID	INTEGER
F	*	Customer_Customer_SID	INTEGER
F	*	Branch_Branch_SID	INTEGER

Rental_PK (Rental_SID)

Branch Address

PF*	Address_SID	INTEGER
PF*	Branch_SID	INTEGER

Branch Address_PK (Address_SID, Branch_SID)

Customer

P	*	Customer_SID	INTEGER
	*	Last_Name	VARCHAR2 (50)
	*	First_Name	VARCHAR2 (50)
		Middle_Name	VARCHAR2 (50)

Customer_PK (Customer_SID)

Customer_Address

PF*	Customer_SID	INTEGER
PF*	Address_SID	INTEGER

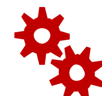
Customer_Address_PK (Customer_SID, Address_

ADDRESS

P	*	Address_SID	INTEGER
	*	Street_Address_1	VARCHAR2 (50)
		Street_Address_2	VARCHAR2 (50)
	*	City	VARCHAR2 (50)
	*	State	CHAR (2)
		Zip	VARCHAR2 (9)

CUSTOMER_ADDRESS_PK (Address_SID)

Logical Data Model.



8.1 Plan Quality Management

Tools & Techniques

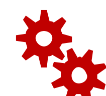


FEATURES	PRODUCT 1	PRODUCT 2	PRODUCT 3
Feature Description	✓	✓	X
Feature Description	✓	X	X
Feature Description	✓	X	✓
Feature Description	✓	✓	X

Customer requirements (WHATs)		Technical Requirements (HOWs)							
		Material Selection			Manufacturing Process				
Primary	Secondary	Steel	Aluminum	Titanium	Welding	Die casting	Sand casting	Forging	Powder metallurgy
Aesthetics	Affordable cost	⊙	⊙	△	⊙	○	⊙	○	△
	Aerodynamic look		△	△	△	⊙	○	○	⊙
	Proper finish	○	⊙	⊙	△	⊙	△	○	⊙
	Corrosion resistant	△	⊙	⊙	△	○	○	○	○
Performance	Light weight	△	○	⊙					△
	Strength	⊙	○	⊙	△	○	○	⊙	△
	Durability	⊙	○	○	△	⊙	○	⊙	○

Relationship between customer requirements and technical descriptors WHAT vs. HOWs		
⊙	Strong	+9
○	Medium	+3
△	Weak	+1

Matrix Diagrams



8.1 Plan Quality Management

Tools & Techniques



06 **TEST AND INSPECTION PLANNING**

PM and the project team determine how to test or inspect the product, deliverable, or service to meet the stakeholders' needs and expectations, as well as how to meet the goal for the product's performance and reliability.

07 **MEETINGS**



8.1 Plan Quality Management Output

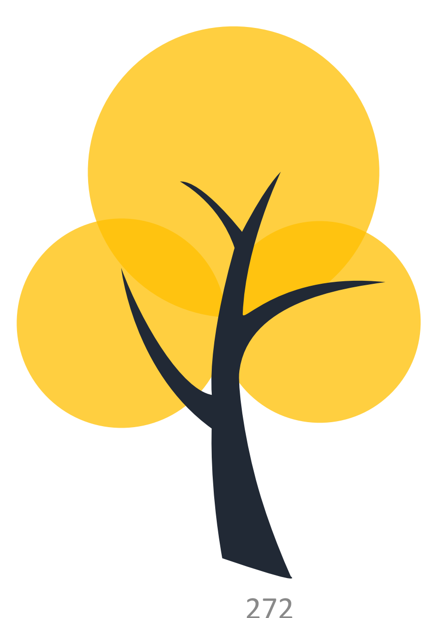


01 QUALITY MANAGEMENT PLAN

- Describes how applicable policies, procedures, and guidelines will be implemented to achieve the quality objectives.
- It describes the activities and resources necessary for the project management team to achieve the quality objectives set for the project.

It may Includes:

- Quality standards.
- Quality objectives.
- Quality roles and responsibilities;
- Quality tools.
- Major procedures relevant for the project, such as dealing with nonconformance, corrective actions procedures, and continuous improvement procedures



8.1 Plan Quality Management   Output



02 QUALITY METRICS

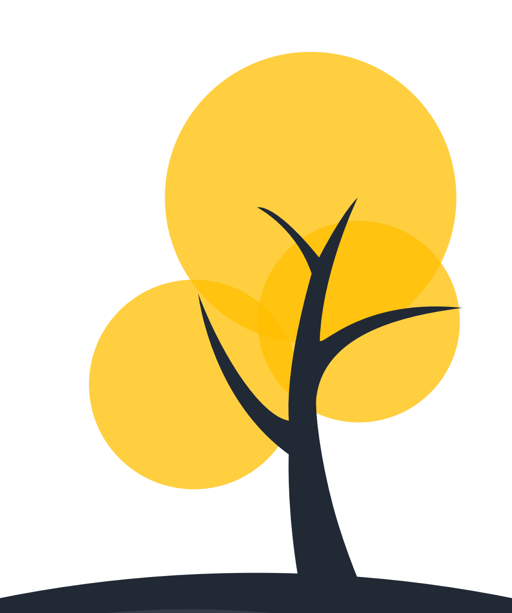
Specifically describes a project or product attribute and how the Control Quality process will verify compliance to it. Like percentage of tasks completed on time, failure rate, number of defects identified per day, or total downtime per month.

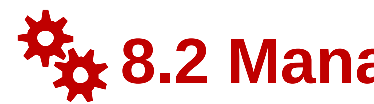
03 PROJECT MANAGEMENT PLAN UPDATES

- Risk management plan.
- Scope baseline

04 PROJECT DOCUMENTS UPDATES

- Lessons learned register
- Requirements traceability matrix.
- Risk register.
- Stakeholder register.





8.2 Manage Quality



Translating the quality management plan into executable quality activities that incorporate the organization's quality policies into the project

Key Benefits:

- increases the probability of meeting the quality objectives
- Identifying ineffective processes and causes of poor quality



- Sometimes called Quality Assurance,
- QA focus on the processes used in the project.
- QA is about using project processes effectively.
- It involves following and meeting standards to assure the final product will meet stakeholders needs, expectations, and requirements.

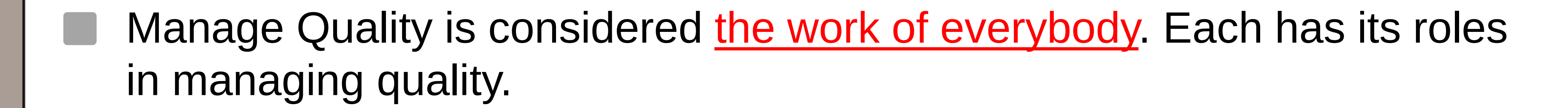


8.2 Manage Quality





- The project manager and project team may use the organization's quality assurance department.
- Quality assurance departments usually have cross-organizational experience in using quality tools and techniques.



- Manage Quality is considered the work of everybody. Each has its roles in managing quality.
- In agile projects, quality management is performed by all team members throughout the project, but in traditional projects, quality management is often the responsibility of specific team members.

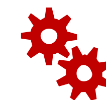


Legend:
New Item
Already Explained Item



Inputs, Tools & Techniques, and Outputs

Inputs		Tools & Techniques		Outputs	
Project management plan (Quality management plan)	7	Data gathering (Checklists)	4	Quality reports	1
Project documents (Lessons learned register)	27	Data analysis (Alternatives analysis)	13	Test and evaluation documents	1
Project documents (Quality control measurements)	2	Data analysis (Document analysis)	5	Change requests	24
Project documents (Quality metrics)	2	Data analysis (Process analysis)	1	Project management plan updates (Quality management plan)	4
Project documents (Risk report)	10	Data analysis (Root cause analysis)	6	Project management plan updates (Scope baseline)	5
Organizational process assets	47	Decision making (Multicriteria decision analysis)	8	Project management plan updates (Schedule baseline)	9
		Data representation (Affinity diagrams)	2	Project management plan updates (Cost baseline)	12
		Data representation (Cause-and-effect diagrams)	2	Project documents updates (Issue log)	14
		Data representation (Flowcharts)	2	Project documents updates (Lessons learned register)	29
		Data representation (Histograms)	2	Project documents updates (Risk register)	23
		Data representation (Matrix diagrams)	2		
		Data representation (Scatter diagrams)	2		
		Audits	3		
		Design for X	1		
		Problem solving	2		
		Quality improvement methods	1		



8.2 Manage Quality



Data Flow Diagrams

Project Management Plan

Project management plan
- Quality management plan

Project Documents

Project documents
- Lessons learned register
- Quality control measurements
- Quality metrics
- Risk report

Enterprise/ Organization

- Organizational process assets

8.2 Manage Quality

4.6 Perform Integrated Change Control

- Change requests

Project Management Plan

Project management plan updates
- Quality management plan
- Scope baseline
- Schedule baseline
- Cost baseline

Project Documents

- Quality reports
- Test and evaluation documents

Project documents updates
- Issue log
- Lessons learned register
- Risk register

8.2 Manage Quality Input



01 **PROJECT MANAGEMENT PLAN**

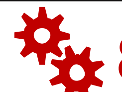
- Quality management plan

02 **PROJECT DOCUMENTS**

- Lessons learned register
- **Quality control measurements**: used to analyse and evaluate the quality of the processes and deliverables of the project **against** the standards of the performing organization or the requirements specified
- Quality metrics
- Risk report

03 **ORGANIZATIONAL PROCESS ASSETS**





8.2 Manage Quality   Tools & Techniques



DATA GATHERING

01 **Checklist**

Is a structured tool used <u>to verify</u> that a set of <u>required steps has been performed</u> or to check if a list of <u>requirements has been satisfied</u>.

Appendix E: Sample quality assurance checklist for PMTCT HIV testing

Region/Provider ______________________

District ______________________

Site ______________________

Date ______________ **Assessor name** ______________________

Assessment instructions: For each question, please write the number 1 if the answer is "Yes" and the number 0 if the answer is "No." As a general standard, a facility score of 80% or higher in each phase category (pre-testing phase, testing phase and post-testing phase) would be considered to be within acceptable quality assurance parameters for HIV rapid testing

Pre-testing phase			
QUESTIONS	YES = 1	NO = 0	COMMENTS
1. Are there routine testing guidelines available which cover all HIV testing in the facility?			
2. Is the testing algorithm used at the facility current and updated according to the national guidelines?			
3. Are there signed records that all HIV testing procedures have been read and understood by HIV rapid testing personnel?			
4. Have all testing personnel received hands-on training in HIV rapid testing?			
5. Are all testing personnel trained in the use of standardized registers/logbooks?			
6. Are all testing personnel trained in safety and waste management procedures?			
7. Are only MOH-approved kits available for use?			
8. Are testing supplies stored in a secure cabinet or room?			
9. Are test kits stored according to the manufacturer's recommendations?			
10. Is the supply inventory updated periodically and expired materials discarded?			
11. When a kit in the algorithm is expired, and there are no kits available, is testing suspended until more kits become available?			
Total number of "Yes" answers ⇨			
Assessment score ⇨ ("Yes" answers divided by total number of questions)			

Guidelines for assessing the utility of data from prevention of mother-to-child transmission (PMTCT) programmes for HIV sentinel surveillance among pregnant women

47

DATA ANALYSIS

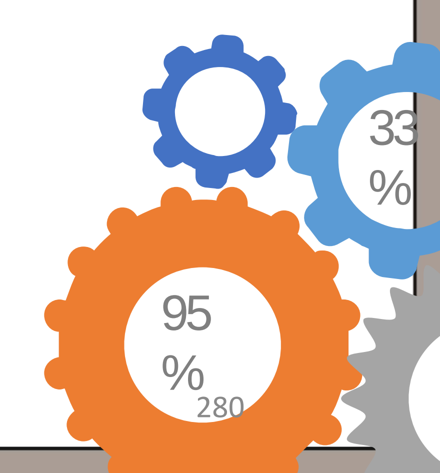
02
- ➢ **Alternatives analysis.**
- ➢ **Document analysis.**
- ➢ **Process analysis.** Identifies opportunities for process improvements.
- ➢ **Root cause analysis (RCA).**



03 **DECISION MAKING** (Multicriteria decision analysis)
Product decisions can include evaluating the life cycle cost, schedule, stakeholder satisfaction, and risks associated with resolving product defects.

04 **DATA REPRESENTATION**

- Affinity diagrams.
- Cause-and-effect diagrams: or fishbone diagrams or why-why diagrams or Ishikawa diagrams. This type of diagram breaks down the causes of the problem statement identified into discrete branches, helping to identify the main or root cause of the problem.
- Flowcharts.





Cause-and-effect diagrams

People
Worker's fatigue
Lack of training

Process
Not enough R&D
Nonoptional manufacturing methods

Equipment
Low maintenance
Old technology
Improper handling

Product quality not matching the requirements

Material
Low quality of raw material
Delay in arrival

Environment
Bad working conditions

Management
Low commitment to quality

95 %



- **Histograms.** Graphical representation of numerical data. It can **show:**
  - The number of defects per deliverable,
  - A ranking of the cause of defects,
  - The number of times each process is noncompliant,

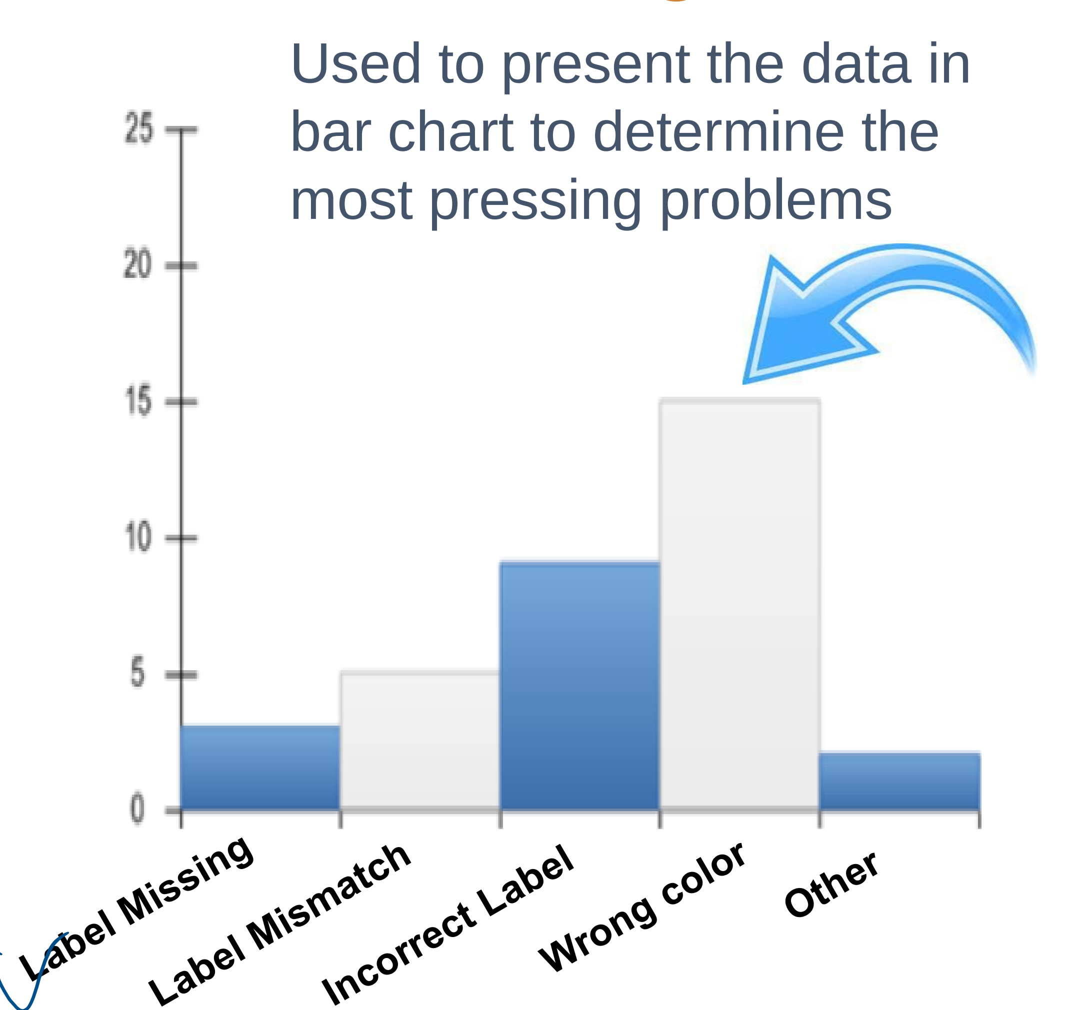
- **Matrix diagrams.**

- **Scatter diagrams.** Graph that shows the relationship between two variables.



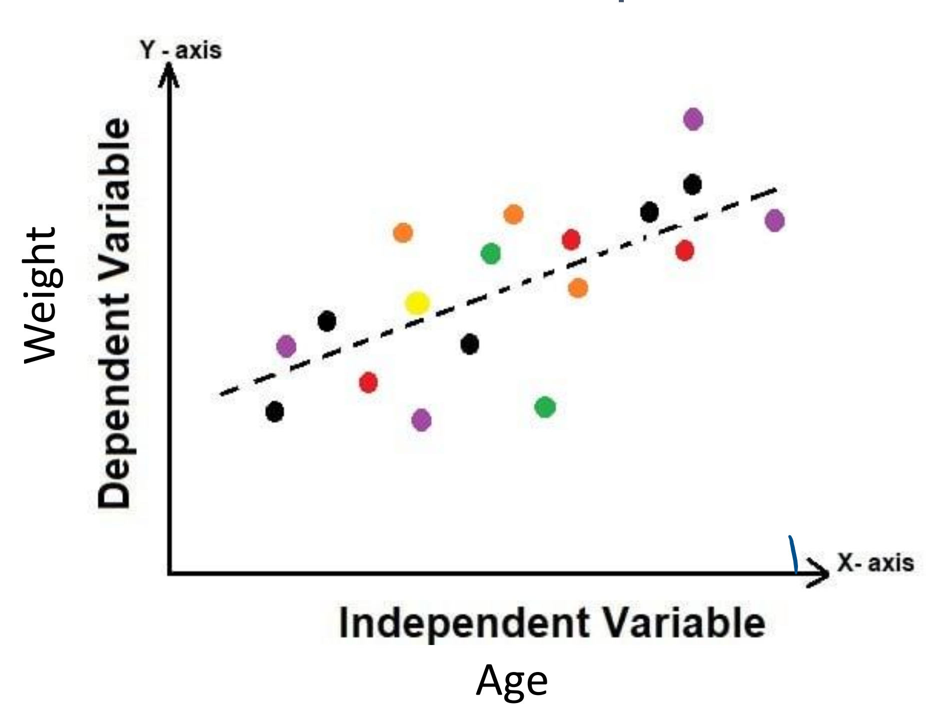
Histogram

Used to present the data in bar chart to determine the most pressing problems



Scatter diagrams

Used to tracks two variables to determine their relationship



8.2 Manage Quality Tools & Techniques



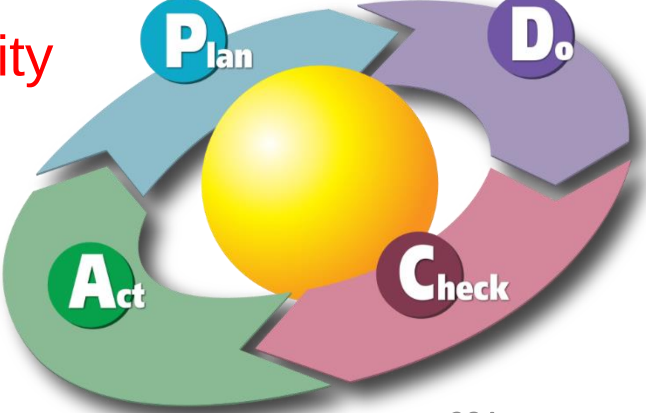
05 AUDITS

An audit is a structured, independent process used to **determine** if project activities comply with organizational and project policies, processes, and procedures. Usually conducted by a team external to the project.

06 QUALITY IMPROVEMENT METHODS

Quality improvements can occur based on findings and recommendations from quality control processes, the findings of the quality audits, or problem solving in the Manage Quality process.

Plan-do-check-act and Six Sigma are two of the most common quality improvement tools.





8.2 Manage Quality Tools & Techniques



07 DESIGN FOR X

- Is a set of technical guidelines that may be applied during the design of a product for the optimization of a specific aspect of the design.
- **DFX** can control or improve the product's final characteristics.
- **The X** in DfX can be different aspects of product development, such as reliability, development, cost, usability, safety, and quality.







08 PROBLEM SOLVING

- Problems can arise from Manage or Control Quality processes and can be associated with a processes or deliverables.
- Problem-solving method will help eliminate the problem and develop a long-lasting solution.
- Defining - Identifying cause - Generating solutions - Choosing solution - Implementing - Verifying effectiveness.

8.2 Manage Quality Output



01 **QUALITY REPORTS**

The quality reports can be graphical, numerical, or qualitative, **include** all quality management issues escalated by the team; recommendations process, project, and product improvements; corrective actions recommendations (including rework, defect/bugs repair).

02 **TEST AND EVALUATION DOCUMENTS**

They are inputs to the Control Quality process and are used to evaluate the achievement of quality objectives. may include dedicated checklists and detailed requirements traceability matrices as part of the document.

03 **CHANGE REQUESTS**

8.2 Manage Quality Output



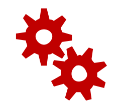
04 Project management plan updates

- Quality management plan
- Scope baseline
- Schedule baseline
- Cost baseline

05 Project documents updates

- Issue log
- Lessons learned register
- Risk register





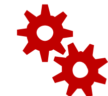
8.3 Control Quality

Legend:
New Item
Already Explained Item



Inputs, Tools & Techniques, and Outputs

Inputs		Tools & Techniques		Outputs	
Project management plan (Quality management plan)	7	Data gathering (Checklists)	4	Quality control measurements	1
Project documents (Lessons learned register)	27	Data gathering (Check sheets)	1	Verified deliverables	1
Project documents (Quality metrics)	2	Data gathering (Statistical sampling)	1	Work performance information	10
Project documents (Test and evaluation documents)	1	Data gathering (Questionnaires and surveys)	3	Change requests	24
Approved change requests	3	Data analysis (Performance reviews)	4	Project management plan updates (Quality management plan)	4
Deliverables	2	Data analysis (Root cause analysis)	6	Project documents updates (Issue log)	14
Work performance data	10	Inspection	3	Project documents updates (Lessons learned register)	29
Enterprise environmental factors	40	Testing/product evaluations	1	Project documents updates (Risk register)	23
Organizational process assets	47	Data representation (Cause-and-effect diagrams)	2	Project documents updates (Test and evaluation documents)	1
		Data representation (Control charts)	1		
		Data representation (Histograms)	2		
		Data representation (Scatter diagrams)	2		
		Meetings	28		



8.3 Control Quality



Data Flow Diagrams

Inputs

Project Management Plan
Project management plan
- Quality management plan

Project Documents
Project documents
- Lessons learned register
- Quality metrics
- Test and evaluation documents

4.3 Direct and Manage Project Work
- Deliverables
- Work performance data

4.6 Perform Integrated Change Control
- Approved change requests

Enterprise/ Organization
- Enterprise environmental factors
- Organizational process assets

8.3 Control Quality

Outputs

4.5 Monitor and Control Project Work
- Work performance information

4.6 Perform Integrated Change Control
- Change requests

5.5 Validate Scope
- Verified deliverables

Project Management Plan
Project management plan updates
- Quality management plan

Project Documents
- Quality control measurements

Project documents updates
- Issue log
- Lessons learned register
- Risk register
- Test and evaluation documents



8.3 Control Quality Input



01 **Project management plan**

- Quality management plan

02 **Project documents**

- Lessons learned register
- Quality metrics
- Test and evaluation documents

03 **Approved change requests**

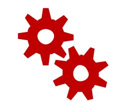
04 **Deliverables**

05 **Work performance data**

06 **Enterprise environmental factors**

07 **Organizational process assets**





8.3 Control Quality Tools & Techniques



01 **DATA GATHERING**

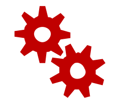
- **Checklist**
- **Check sheets**. (Tally sheets), used to organize facts in a manner that will facilitate the effective collection of useful data about a potential quality problem.
- **Statistical sampling**. involves choosing part of a population of interest for inspection. Sample frequency and sizes should be determined during the Plan Quality Management process
- **Questionnaires and Surveys**

	Monday	Tuesday	Wednesday
Wrong orders	///	HHT	HHT HHT HHT HHT //
Reworked orders		/	//
Late deliveries	HHT ///	/	///
Shipping damage			
Late payments		/	
Totals	11	8	27

02 **DATA ANALYSIS**

- **Performance reviews.** measure, compare, and analyze the **quality metrics** defined by the Plan process against the actual results.
- **Root cause analysis (RCA)**

03 **INSPECTION**: Is the examination of a work product to determine if it **conforms** to documented standards. Inspections may be called reviews, peer reviews, audits, or walkthroughs.



8.3 Control Quality Tools & Techniques



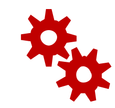
04 TESTING/PRODUCT EVALUATIONS

Testing is an organized and constructed investigation **conducted to** provide objective information about the quality of the product or service in accordance with requirements.

- The **intent of testing** is to find errors, defects, bugs, or other nonconformance problems in the product or service.
- Tests **can be performed** throughout the project, as different components of the project become available, and at the end of the project on the final deliverables.
- Early testing helps identify nonconformance problems and reduce the cost of fixing the nonconforming components.

33 %

95 %



8.3 Control Quality Tools & Techniques

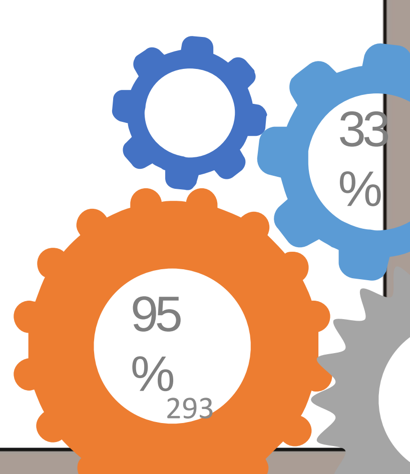


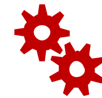
05 DATA REPRESENTATION

- **Cause-and-effect diagrams**
- **Histograms**
- **Scatter diagrams.**
- **Control Charts.**

Used to determine whether or not a process is **stable** or has predictable performance.

- Upper and lower specification limits are based on the requirements.
- The control limits are determined using standard statistical calculations and principles to ultimately establish the natural capability for a stable process.
- The PM and Stakeholder use the statistically calculated control limits to identify the points at which corrective action will be taken to prevent performance that remains outside the control limits.



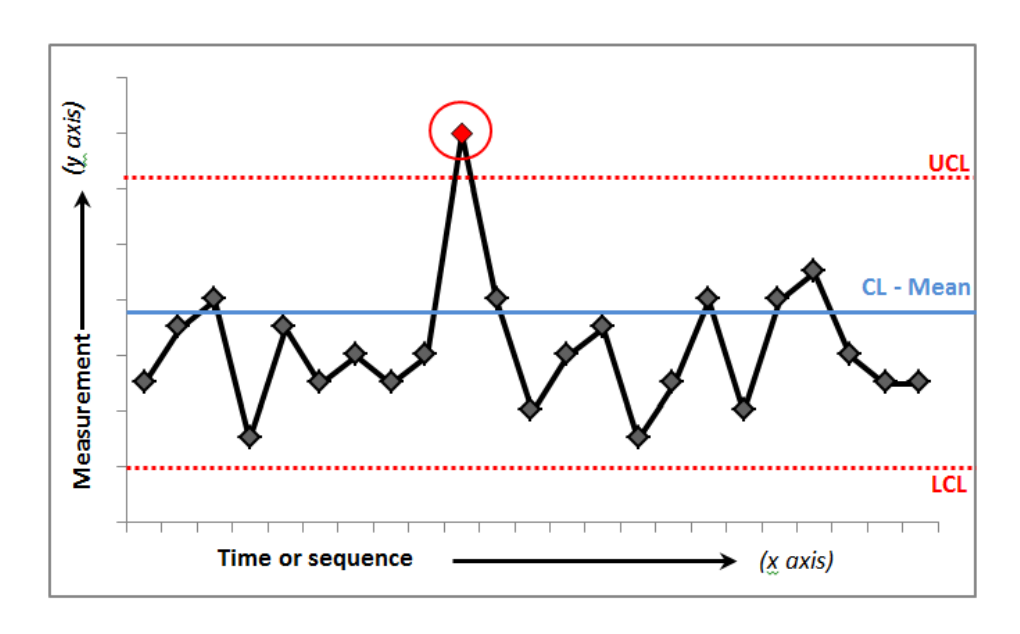


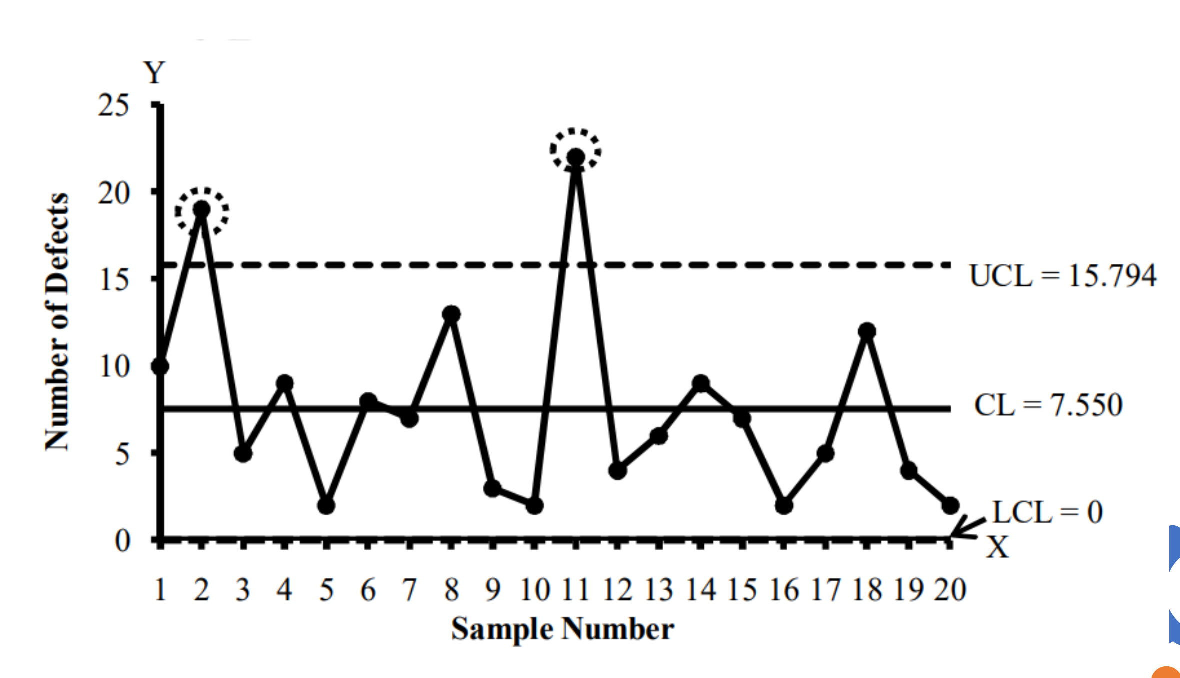
8.3 Control Quality Tools & Techniques



Control charts

- Can be used to monitor various types of output variables.
- Control charts may also be used to monitor cost and schedule variances, volume, frequency of scope changes, or other management results





06 MEETINGS

- To review the Approved Change Requests
- To review the lesson learned: to improve the quality in future.

33 %
95 %

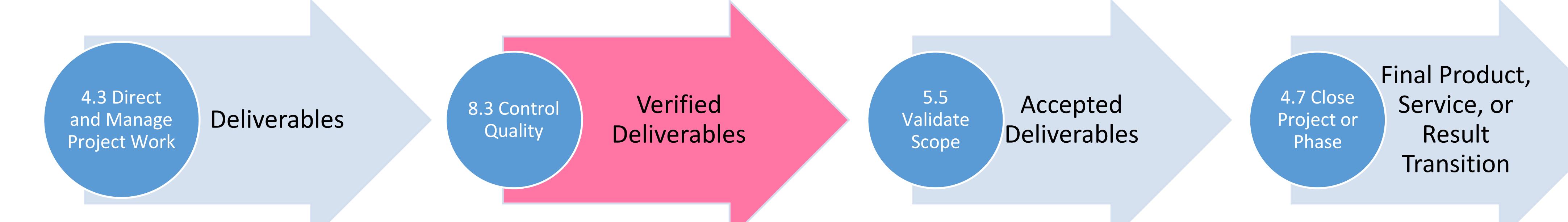
8.3 Control Quality Output



01 **QUALITY CONTROL MEASUREMENTS**. documented results of Control Quality activities

02 **VERIFIED DELIVERABLES**

The results of performing the Control Quality process are verified deliverables that become an input to the Validate Scope process for formalized acceptance.



03 WORK PERFORMANCE INFORMATION

04 CHANGE REQUESTS

05 PROJECT MANAGEMENT PLAN UPDATES (Quality management plan)

06 PROJECT DOCUMENTS UPDATES

- Issue log.
- Lessons learned register.
- Risk register
- Test and evaluation documents.



9. PROJECT RESOURCE MANAGEMENT



Presented by :
Abdulfattah Ajlan
Certified PMP Trainer

Project Resource Management



- Project Resource Management includes the processes to identify, acquire, and manage the resources needed for the successful completion of the project.

- Project Resource Management help ensure that the right resources will be available to the project manager and project team at the right time and place.



Resource could be:

- Team Resource : Refer to the human resources.
- Physical Resource : equipment, materials, facilities, and infrastructure.

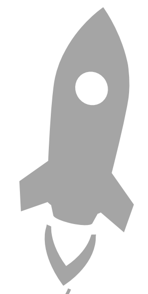
What about money?

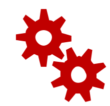
Knowledge Areas	Project Management Process Groups				
	Initiating	Planning	Executing	Monitoring and Controlling	Closing
Project Integration Management	4.1 Develop Project Charter	4.2 Develop Project Management Plan	4.3 Direct and Manage Project Work 4.4 Manage Project Knowledge	4.5 Monitor and Control Project Work 4.6 Perform Integrated Change Control	4.7 Close Project
Project Scope Management		5.1 Plan Scope Management 5.2 Collect Requirements 5.3 Define Scope 5.4 Create WBS		5.5 Validate Scope 5.6 Control Scope	
Project Schedule Management		6.1 Plan Schedule 6.2 Define Activities 6.3 Sequence Activities 6.4 Estimate Activity Durations 6.5 Develop Schedule Management		6.6 Control Schedule	
Project Cost Management		7.1 Plan Cost Management 7.2 Estimate Costs 7.3 Determine Budge		7.4 Control Costs	
Project Quality Management		8.1 Plan Quality Management	8.2 Manage Quality	8.3 Control Quality	
Project Resource Management		9.1 Plan Resource Management 9.2 Estimate Activity Resources	9.3 Acquire Resources 9.4 Develop Team 9.5 Manage Team	9.6 Control Resources	
Project Communications Management		10.1 Plan Communications Management	10.2 Manage Communications	10.3 Monitor Communications	
Project Risk Management		11.1 Plan Risk Management 11.2 Identify Risks 11.3 Perform Qualitative Risk Analysis 11.4 Perform Quantitative Risk Analysis 11.5 Plan Risk Responses	11.6 Implement Risk Responses	11.7 Monitor Risks	
Project Procurement Management		12.1 Plan Procurement Management	12.2 Conduct Procurements	12.3 Control Procurements	
Project Stakeholder Management	13.1 Identify Stakeholders	13.2 Plan Stakeholder Engagement	13.3 Manage Stakeholder Engagement	13.4 Monitor Stakeholder Engagement	

TRENDS AND EMERGING PRACTICES IN PROJECT RESOURCE MANAGEMENT



- **Project management styles** are shifting from a command and control structure for managing projects and toward a more collaborative and supportive management approach that empowers teams by delegating decision making to the team members.
- **Emotional intelligence (EI).** The project manager should invest in personal **EI** by improving inbound (e.g.,self-management and self-awareness) and outbound (e.g., relationship management) competencies.
- [redacted]





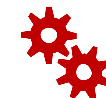
9.1 Plan Resource Management

Legend:
New Item
Already Explained Item



Inputs, Tools & Techniques, and Outputs

Inputs		Tools & Techniques		Outputs	
Project charter	14	Expert judgment	35	Resource management plan	1
Project management plan (Quality management plan)	7	Data representation (Hierarchical charts)	2	Team charter	1
Project management plan (Scope baseline)	16	Data representation (Responsibility assignment matrix)	1	Project documents updates (Assumption log)	17
Project documents (Project schedule)	11	Data representation (Text-oriented formats)	1	Project documents updates (Risk register)	23
Project documents (Requirements documentation)	13	Organizational theory	1		
Project documents (Risk register)	22	Meetings	28		
Project documents (Stakeholder register)	17				
Enterprise environmental factors	40				
Organizational process assets	47				



9.1 Plan Resource Management



Data Flow Diagrams

4.1
Develop
Project
Charter

- Project charter

Project
Management
Plan

Project management plan
- Quality management plan
- Scope baseline

Project
Documents

Project documents
- Project schedule
- Requirements documentation
- Risk register
- Stakeholder register

Enterprise/
Organization

- Enterprise environmental factors
- Organizational process assets

9.1
Plan
Resource
Management

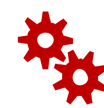
- Resource management plan

Project
Management
Plan

- Team charter

Project documents updates
- Assumption log
- Risk register

Project
Documents



9.1 Plan Resource Management

Input



01 **Project charter**

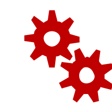
02 **Project management plan**
- Quality management plan
- Scope baseline

03 **Project documents**
- Project schedule
- Requirements documentation
- Risk register
- Stakeholder register

04 **Enterprise environmental factors**

05 **Organizational process assets**





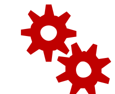


01 **EXPERT JUDGMENT**

02 **DATA REPRESENTATION**

- **Hierarchical charts.** The traditional chart structure can be used to show positions and relationships in a graphical, top-down format. Such as organizational chart and WBS.

Hierarchical charts



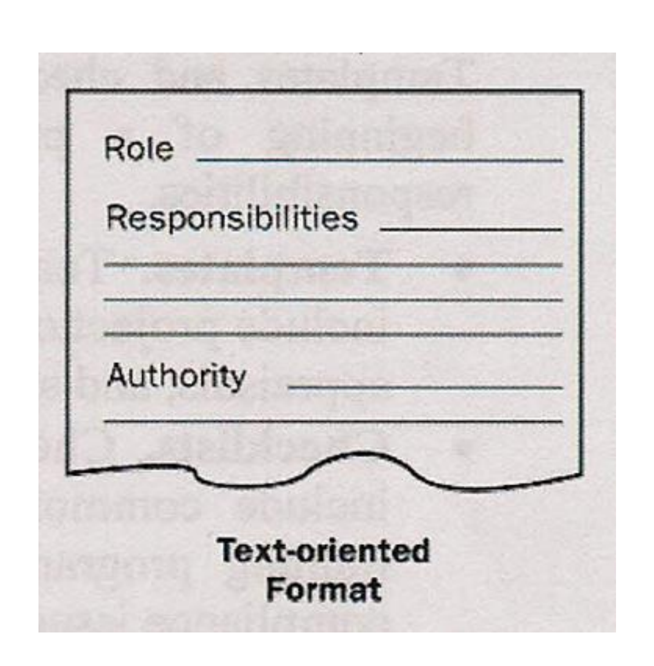
9.1 Plan Resource Management

Tools & Techniques



- **Responsibility Assignment Matrix** - RAM: Shows the project resources assigned to **each work package**. One example of a RAM is a **RACI** (Responsible, Accountable, Consulted, Informed)

RACI Chart	Person				
Activity	Ann	Ben	Carlos	Dina	Ed
Define	A	R	I	I	I
Design	I	A	R	C	C
Develop	I	A	R	C	C
Test	A	I	I	R	I



- **Text-oriented formats.** Team member responsibilities that require detailed descriptions can be specified in text oriented formats.
- Usually in outline form, these documents provide information such as responsibilities, authority, competencies, and qualifications, such as Job Description

03 **ORGANIZATIONAL THEORY**

Provides information regarding the way in which people, teams, and organizational units behave. Effective use of common techniques identified in organizational theory can shorten the amount of time, cost, and effort needed to create the Resource Management Plan.

04 **MEETINGS**

9.1 Plan Resource Management Output



01 RESOURCE MANAGEMENT PLAN

Provides guidance on how project resources should be categorized, allocated, managed, and released.

Resource Management Plan may include :

- Identification of resources
- Acquiring resources instructions
- Roles and responsibilities
- Project organization charts.
- Training
- Team development
- Resource control
- Recognition and rewards plan



9.1 Plan Resource Management Output





TEAM CHARTER

A document that establishes the team values, agreements, and operating guidelines for behavior of the team.

It may includes:

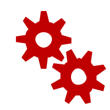
- Communication guidelines.
- Decision-making criteria and process.
- Conflict resolution process.
- Meeting guidelines.
- Team agreements.



03

PROJECT DOCUMENTS UPDATES

- Assumption log
- Risk register



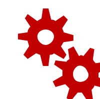
9.2 Estimate Activity Resources

Legend:
New Item
Already Explained Item



Inputs, Tools & Techniques, and Outputs

Inputs		Tools & Techniques		Outputs	
Project management plan (Resource management plan)	14	Expert judgment	35	Resource requirements	1
Project management plan (Scope baseline)	16	Bottom-up estimating	3	Basis of estimates	3
Project documents (Activity attributes)	4	Analogous estimating	3	Resource breakdown structure	1
Project documents (Activity list)	4	Parametric estimating	3	Project documents updates (Activity attributes)	4
Project documents (Assumption log)	14	Data analysis (Alternatives analysis)	13	Project documents updates (Assumption log)	17
Project documents (Cost estimates)	4	Project management information system	12	Project documents updates (Lessons learned register)	29
Project documents (Resource calendars)	7	Meetings	28		
Project documents (Risk register)	22				
Enterprise environmental factors	40				
Organizational process assets	47				



9.2 Estimate Activity Resources



Data Flow Diagrams

Project Management Plan

Project management plan
- Resource management plan
- Scope baseline

Project Documents

Project documents
- Activity attributes
- Activity list
- Assumption log
- Cost estimates
- Resource calendars
- Risk register

Enterprise/ Organization

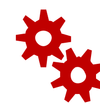
- Enterprise environmental factors
- Organizational process assets

9.2 Estimate Activity Resources

- Resource requirements
- Basis of estimates
- Resource breakdown structure

Project Documents

Project document updates
- Activity attributes
- Assumption log
- Lessons learned register



9.2 Estimate Activity Resources Input



01 **PROJECT MANAGEMENT PLAN**
- Resource management plan
- Scope baseline

02 **PROJECT DOCUMENTS**
- Activity attributes
- Activity list
- Assumption log
- Cost estimates
- Resource calendars
- Risk register

03 **EEF**

04 **OPA**



9.2 Estimate Activity Resources

Tools & Techniques



01 EXPERT JUDGMENT

02 BOTTOM-UP ESTIMATING

03 ANALOGOUS ESTIMATING

04 PARAMETRIC ESTIMATING

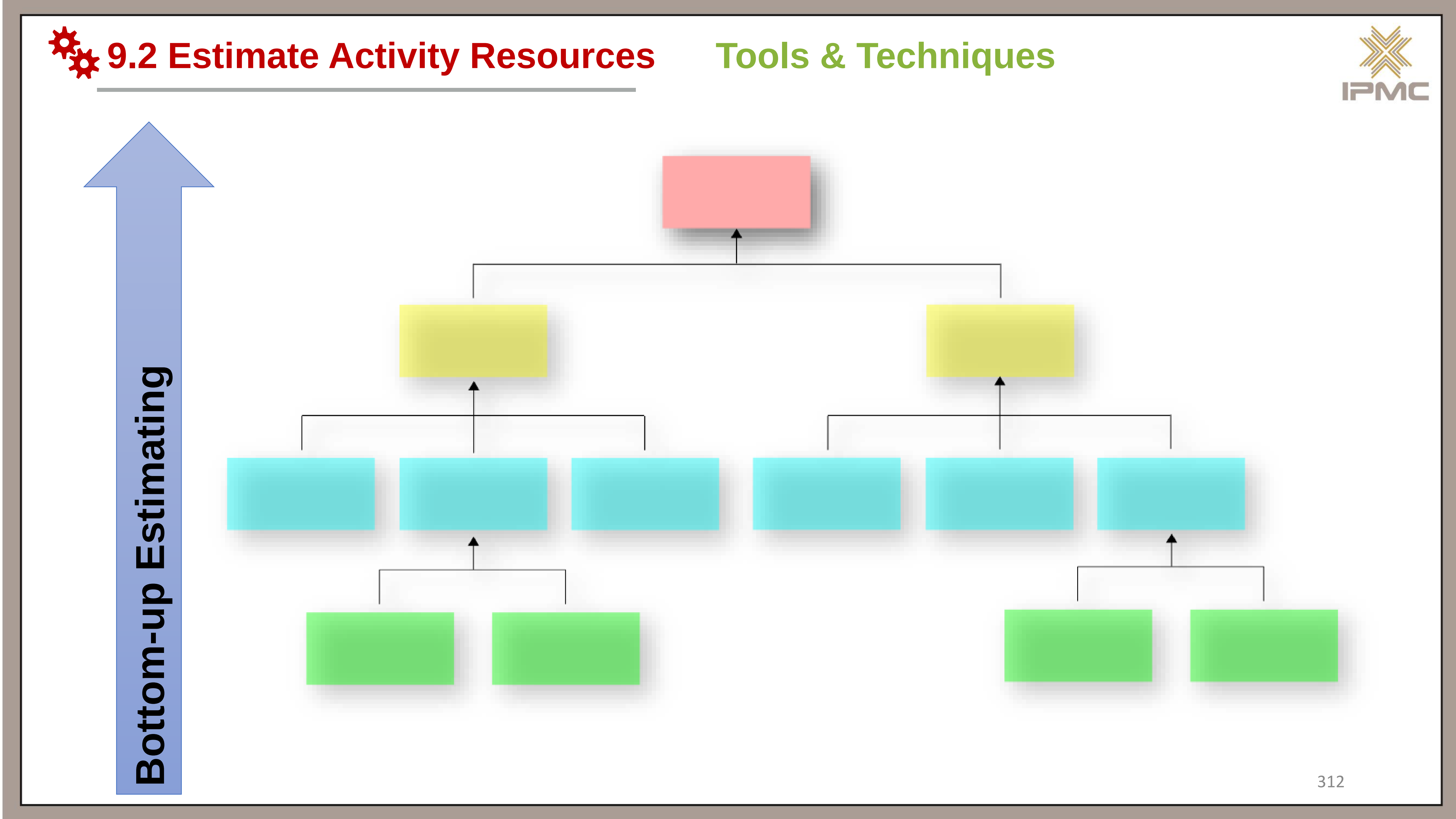
05 DATA ANALYSIS

- Alternatives Analysis

06 PROJECT MANAGEMENT INFORMATION SYSTEM

07 MEETINGS




9.2 Estimate Activity Resources
Tools & Techniques
IPMC
Bottom-up Estimating
312

9.2 Estimate Activity Resources Output



01 RESOURCE REQUIREMENTS

Identify the types and quantities of resources required **for each work package or activity** in a work package and can be aggregated to determine the estimated resources for each work package, each WBS branch, and the project as a whole.

02 BASIS OF ESTIMATES

The amount and type of additional details supporting the resource estimate vary by application area.

03 RESOURCE BREAKDOWN STRUCTURE

A hierarchical representation of resources by **category** and **type**.
Categories include but are not limited to labor, material, equipment, and supplies.
Type include the skill level, grade level, required certifications, or other information.

04 PROJECT DOCUMENTS UPDATES

- Activity attributes
- Assumption log
- Lessons learned register

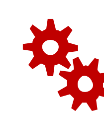


9.2 Estimate Activity Resources Output



Project
- Personnel
  - Role 1
    - Level 1
    - Level 2
  - Role 2
  - Role 3
- Material
  - Material 1
  - Material 2
    - Grade 2
- Equipment
  - Equipment 1
  - Equipment 2

Resource Breakdown Structure



9.3 Acquire Resources





ACQUIRE RESOURCES

Is the process of obtaining team members, facilities, equipment, materials, supplies, and other resources necessary to complete project work.



THE KEY BENEFIT

It outlines and guides the selection of resources and assigns them to their respective activities.





This process is performed periodically throughout the project as needed.

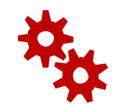
9.3 Acquire Resources



- The resources needed for the project can be internal or external to the project-performing organization.
  - Internal resources are acquired (assigned) from **functional or resource managers**.
  - External resources are acquired through the **procurement processes.**

- The project manager or project management team will be required to **document the impact** of the unavailability of required resources in the project schedule, project budget, project risks, project quality, training plans, and other project management plans





9.3 Acquire Resources

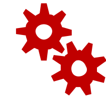



Legend:
New Item
Already Explained Item



Inputs, Tools & Techniques, and Outputs

Inputs		Tools & Techniques		Outputs	
Project management plan (Resource management plan)	14	Decision making (Multicriteria decision analysis)	8	Physical resource assignments	1
Project management plan (Procurement management plan)	3	Interpersonal and team skills (Negotiation)	5	Project team assignments	1
Project management plan (Cost baseline)	7	Pre-assignment	1	Resource calendars	1
Project documents (Project schedule)	11	Virtual teams	2	Change requests	24
Project documents (Resource calendars)	7			Project management plan updates (Resource management plan)	6
Project documents (Resource requirements)	8			Project management plan updates (Cost baseline)	12
Project documents (Stakeholder register)	17			Project documents updates (Lessons learned register)	29
Enterprise environmental factors	40			Project documents updates (Project schedule)	7
Organizational process assets	47			Project documents updates (Resource breakdown structure)	2
				Project documents updates (Resource requirements)	3
				Project documents updates (Risk register)	23
				Project documents updates (Stakeholder register)	12
				Enterprise environmental factors updates	3
				Organizational process assets updates	10



9.3 Acquire Resources



Data Flow Diagrams

Project Management Plan

Project management plan
- Resource management plan
- Procurement management plan
- Cost baseline

Project Documents

Project documents
- Project schedule
- Resource calendars
- Resource requirements
- Stakeholder register

Enterprise/ Organization

- Enterprise environmental factors
- Organizational process assets

9.3 Acquire Resources

- Change requests

4.6 Perform Integrated Change Control

Project Management Plan

Project management plan updates
- Resource management plan
- Cost baseline

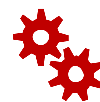
- Physical resource assignments
- Project team assignments
- Resource calendars

Project Documents

Project documents updates
- Lessons learned register
- Project schedule
- Resource breakdown structure
- Resource requirements
- Risk register
- Stakeholder register

- Enterprise environmental factors updates
- Organizational process assets updates

Enterprise/ Organization



9.3 Acquire Resources Input



01 **PROJECT MANAGEMENT PLAN**
- Resource management plan
- Procurement management plan
- Cost baseline

02 **PROJECT DOCUMENTS**
- Project schedule
- Resource calendars
- Resource requirements
- Stakeholder register

03 **Enterprise environmental factors**

04 **Organizational process assets**



9.3 Acquire Resources Tools & Techniques



01 DECISION MAKING

Using a Multi-criteria decision analysis tool, criteria are developed and used to rate or score potential ,The criteria are weighted according to their relative importance and values can be changed for different types of resources.

Unique selection criteria that for team resources are:

- **Experience**: Verify that the team member has the relevant experience.
- **Knowledge:** Consider if the team member has relevant knowledge of the customer, similar implemented projects, and nuances of the project environment.
- **Skills:** Determine if the team member has the relevant skills to use a project tool.
- **Attitude:** Determine if the team member has the ability to work with others as a cohesive team.
- **International factors:** Consider team member location, time zone, and communication capabilities.



Tools & Techniques



02 INTERPERSONAL AND TEAM SKILLS

❖ **Negotiate:**

The project management team may need to negotiate with:

- Functional managers.
- Other project management teams.
- External organizations and suppliers.

03 PRE-ASSIGNMENT

When physical or team resources for a project are determined **in advance**, they are **considered pre-assigned**. (when resources being identified as part of a competitive proposal, or if the project is dependent upon the expertise of particular persons).



9.3 Acquire Resources

Tools & Techniques



04 **VIRTUAL TEAMS**

Virtual teams can be defined as groups of people with a **shared goal** who fulfill their roles with **little or no time spent meeting face to face**.

The availability of communication technology has made virtual teams feasible. The virtual team model makes it possible to:

- Form teams of people who live in widespread geographic areas.
- Add special expertise.
- Work from home offices.
- Form teams of people who work different shifts, hours, or days.
- Include people with mobility limitations or disabilities.
- Move forward with projects that would have been held or canceled due to travel expenses.
- Save the expense of offices and all physical equipment.

9.3 Acquire Resources Output





01 **PHYSICAL RESOURCE ASSIGNMENTS**

Documentation of the physical resource assignments records the material, equipment, supplies, locations, and other physical resources that will be used during the project.

02 **PROJECT TEAM ASSIGNMENTS**

Documentation of team assignments records the team members and their roles and responsibilities for the project.

03 **RESOURCE CALENDARS**

Identifies the *working days, shifts, start and end of normal business hours, weekends, and public holidays* when each specific resource is available.
Also specify when and for how long identified team and physical resources will be available during the project.

04 **CHANGE REQUESTS**

9.3 Acquire Resources Output





05 **PROJECT MANAGEMENT PLAN UPDATES**

- Resource management plan.
- Cost baseline.

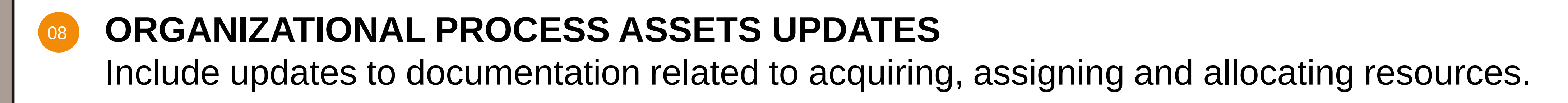


06 **PROJECT DOCUMENTS UPDATES**

- Lessons learned register.
- Project schedule
- Resource breakdown structure.
- Resource requirements.
- Risk register.
- Stakeholder register.

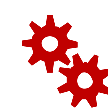
07 **ENTERPRISE ENVIRONMENTAL FACTORS UPDATES**

- Resource availability within the organization.
- Amount of the organization’s consumable resources that have been used.



08 **ORGANIZATIONAL PROCESS ASSETS UPDATES**

Include updates to documentation related to acquiring, assigning and allocating resources.



9.4 Develop Team





DEVELOP TEAM

is the process of **improving** competencies, team member interaction, and the overall team environment **to enhance project performance**.



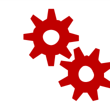


THE KEY BENEFIT

it results in improved teamwork, enhanced interpersonal skills and competencies, motivated employees, reduced attrition, and improved overall project performance.



This process is performed periodically throughout the project as needed



9.4 Develop Team



The Tuckman Model

Forming

Storming

Norming

Performing

Adjourning

Performance

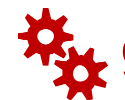
Forming
facts

Storming
emotions

Norming
values

Performing
actions

Time



9.4 Develop Team





Inputs, Tools & Techniques, and Outputs

Inputs		Tools & Techniques		Outputs	
Project management plan (Resource management plan)	14	Colocation	1	Team performance assessments	1
Project documents (Lessons learned register)	27	Virtual teams	2	Change requests	24
Project documents (Project schedule)	11	Communication technology	3	Project management plan updates (Resource management plan)	6
Project documents (Project team assignments)	7	Interpersonal and team skills (Conflict management)	6	Project documents updates (Lessons learned register)	29
Project documents (Resource calendars)	7	Interpersonal and team skills (Influencing)	4	Project documents updates (Project schedule)	7
Project documents (Team charter)	2	Interpersonal and team skills (Motivation)	1	Project documents updates (Project team assignments)	4
Enterprise environmental factors	40	Interpersonal and team skills (Negotiation)	5	Project documents updates (Resource calendars)	3
Organizational process assets	47	Interpersonal and team skills (Team building)	1	Project documents updates (Team charter)	1
		Recognition and rewards	1	Enterprise environmental factors updates	3
		Training	1	Organizational process assets updates	10
		Individual and team assessments	1		
		Meetings	28		



9.4 Develop Team



Data Flow Diagrams

Project Management Plan

Project management plan
- Resource management plan

Project Documents

Project documents
- Lessons learned register
- Project schedule
- Project team assignments
- Resource calendars
- Team charter

Enterprise/ Organization

- Enterprise environmental factors
- Organizational process assets

9.4 Develop Team

9.5 Manage Team

- Team performance assessments

4.6 Perform Integrated Change Control

- Change requests

Project Management Plan

Project management plan updates
- Resource management plan

Project Documents

Project documents updates
- Lessons learned register
- Project schedule
- Project team assignments
- Resource calendars
- Team charter

Enterprise/ Organization

- Enterprise environmental factors updates
- Organizational process assets updates



9.4 Develop Team Input





01 **PROJECT MANAGEMENT PLAN**
- Resource management plan

02 **PROJECT DOCUMENTS**
- Lessons learned register
- Project schedule
- Project team assignments
- Resource calendars
- Team charter

03 **Enterprise environmental factors**

04 **Organizational process assets**



9.4 Develop Team Tools & Techniques



01 **COLOCATION**: involves placing many or all of the most active project team members in the same physical location to **enhance their ability to perform as a team**.

02 **VIRTUAL TEAMS**

03 **COMMUNICATION TECHNOLOGY**

- Shared portal.
- Conferencing.
- Audio conferencing.
- Email/chat..

04 **INTERPERSONAL AND TEAM SKILLS**

- **Conflict management**
- **Influencing**: Reach agreements while maintaining mutual trust.
- **Motivation**: Providing a reason for someone to act.
- **Negotiation.**
- **Team building**: Conducting activities that enhance the team's social relations and build a collaborative and cooperative working environment.





05 RECOGNITION AND REWARDS

- Involves recognizing and rewarding desirable behavior.
- Rewards will be effective only if they satisfy a need that is valued by that individual.
- Reward decisions are made, formally or informally,

06 TRAINING

Includes all activities designed to enhance the competencies of the project team members.
Can be formal or informal.

07 INDIVIDUAL AND TEAM ASSESSMENTS

Give the project manager and the project team insight into areas of strengths and weaknesses.
Help project managers assess team members' preferences, aspirations, how they make decisions,

08 MEETINGS

9.4 Develop Team Output



01 **TEAM PERFORMANCE ASSESSMENTS**

As a result of conducting an evaluation of the project management team **Project Manager can:**
identify the specific training, coaching, mentoring, assistance, or changes required to improve the team's performance.

02 **CHANGE REQUESTS**

03 **PROJECT MANAGEMENT PLAN UPDATES**

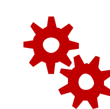
04 **PROJECT DOCUMENTS UPDATES**

05 **ENTERPRISE ENVIRONMENTAL FACTORS UPDATES**

- Employee development plan records
- Skill assessments

06 **ORGANIZATIONAL PROCESS ASSETS UPDATES**





9.5 MANAGE TEAM





MANAGE TEAM

Is the process of tracking team member performance, providing feedback, resolving issues, and managing team changes to optimize project performance.



THE KEY BENEFIT

It influences team behavior, manages conflict, and resolves issues.



This process is performed throughout the project as needed.





9.5 MANAGE TEAM

Legend:
New Item
Already Explained Item



Inputs, Tools & Techniques, and Outputs

Inputs		Tools & Techniques		Outputs	
Project management plan (Resource management plan)	14	Interpersonal and team skills (Conflict management)	6	Change requests	24
Project documents (Issue log)	12	Interpersonal and team skills (Decision making)	1	Project management plan updates (Resource management plan)	6
Project documents (Lessons learned register)	27	Interpersonal and team skills (Emotional intelligence)	1	Project management plan updates (Schedule baseline)	9
Project documents (Project team assignments)	7	Interpersonal and team skills (Influencing)	4	Project management plan updates (Cost baseline)	12
Project documents (Team charter)	2	Interpersonal and team skills (Leadership)	3	Project documents updates (Issue log)	14
Work performance reports	4	Project management information system	12	Project documents updates (Lessons learned register)	29
Team performance assessments	1			Project documents updates (Project team assignments)	4
Enterprise environmental factors	40			Enterprise environmental factors updates	3
Organizational process assets	47				



9.5 MANAGE TEAM



Data Flow Diagrams



9.5 MANAGE TEAM Input



01 **PROJECT MANAGEMENT PLAN**
- Resource management plan

02 **PROJECT DOCUMENTS**
- Issue log
- Lessons learned register
- Project team assignments
- Team charter

03 **WORK PERFORMANCE REPORTS**

04 **TEAM PERFORMANCE ASSESSMENTS**

05 **Enterprise environmental factors**

06 **Organizational process assets**



9.5 MANAGE TEAM

Tools & Techniques





01 **INTERPERSONAL AND TEAM SKILLS**



Conflict Management.

Sources of conflict include :

- Scarce resources.
- Scheduling priorities.
- Personal work styles.

Team **ground rules**, **group norms**, **solid project management practices**, and **successful conflict management** **results in** **greater productivity and positive working relationships**.



Tools & Techniques



Five general techniques for resolving conflict

Compromise التوافق

Searching for solutions that bring some degree of satisfaction to all parties,

Lose-Lose

Force/ direct. الإجبار/التوجيه

Pushing one's viewpoint at the expense of others, **Win/Lose.**

Accommodate التسوية

Emphasizing areas of agreement rather than areas of difference

Collaborate التعاون/حل المشكلة

Incorporating multiple viewpoints and insights from differing perspectives,

Win-Win.

Avoid تجنب

Postponing the issue to be better prepared or to be resolved by others.

Compromise/ reconcile.

Force/ direct.

Smooth/ accommodate

Collaborate/ problem solve.

Withdraw/ avoid



- **Decision making.**
  Involves the ability to negotiate and influence the organization and the project management team.

- **Emotional intelligence.**
  Emotional intelligence is the ability to identify, assess, and manage the **personal emotions** of oneself and other people, as well as the collective emotions of groups of people.

  The team can use emotional intelligence to reduce tension and increase cooperation by identifying, assessing, and controlling the sentiments of project team members, anticipating their actions, acknowledging their concerns, and following up on their issues.

9.5 MANAGE TEAM Tools & Techniques



Influencing.
Because project managers often have little or no direct authority over team members in a matrix environment, their ability to influence stakeholders on a timely basis is critical to project success.

Leadership. is the ability to lead a team and inspire them to do their jobs well. Leadership is important through all phases of the project life cycle.

02 **PROJECT MANAGEMENT INFORMATION SYSTEM (PMIS)**



9.5 MANAGE TEAM Output



01 **CHANGE REQUESTS**

02 **PROJECT MANAGEMENT PLAN UPDATES**

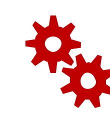
- Resource management plan
- Schedule baseline
- Cost baseline

03 **PROJECT DOCUMENTS UPDATES**

- Issue log
- Lessons learned register
- Project team assignments

04 **ENTERPRISE ENVIRONMENTAL FACTORS UPDATES**





9.6 Control Resources





CONTROL RESOURCES

Is the process of **ensuring that** the physical **resources assigned** and **allocated** to the project are available as planned, as well as monitoring the planned versus actual **utilization** of resources and taking corrective action as necessary.



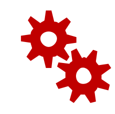
THE KEY BENEFIT

To ensuring that the assigned resources are available to the project at the right time and in the right place and are released when no longer needed.



This process is performed throughout the project as needed





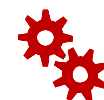
9.6 Control Resources

Legend:
New Item
Already Explained Item



Inputs, Tools & Techniques, and Outputs

Inputs		Tools & Techniques		Outputs	
Project management plan (Resource management plan)	14	Data analysis (Alternatives analysis)	13	Work performance information	10
Project documents (Issue log)	12	Data analysis (Cost-benefit analysis)	5	Change requests	24
Project documents (Lessons learned register)	27	Data analysis (Performance reviews)	4	Project management plan updates (Resource management plan)	6
Project documents (Physical resource assignments)	1	Data analysis (Trend analysis)	7	Project management plan updates (Schedule baseline)	9
Project documents (Project schedule)	11	Problem solving	2	Project management plan updates (Cost baseline)	12
Project documents (Resource breakdown structure)	3	Interpersonal and team skills (Negotiation)	5	Project documents updates (Assumption log)	17
Project documents (Resource requirements)	8	Interpersonal and team skills (Influencing)	4	Project documents updates (Issue log)	14
Project documents (Risk register)	22	Project management information system	12	Project documents updates (Lessons learned register)	29
Work performance data	10			Project documents updates (Physical resource assignments)	1
Agreements	11			Project documents updates (Resource breakdown structure)	2
Organizational process assets	47			Project documents updates (Risk register)	23



9.6 Control Resources



Data Flow Diagrams

Project Management Plan

Project management plan
- Resource management plan

Project Documents

Project documents
- Issue log
- Lessons learned register
- Physical resource assignments
- Project schedule
- Resource breakdown structure
- Resource requirements
- Risk register

4.3 Direct and Manage Project Work
- Work performance data

12.2 Conduct Procurements
- Agreements

Enterprise/ Organization
- Organizational process assets

9.6 Control Resources

4.5 Monitor and Control Project Work
- Work performance information

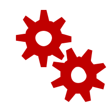
4.6 Perform Integrated Change Control
- Change requests

Project Management Plan

Project management plan updates
- Resource management plan
- Schedule baseline
- Cost baseline

Project Documents

Project documents updates
- Assumption log
- Issue log
- Lessons learned register
- Physical resource assignments
- Resource breakdown structure
- Risk register



9.6 Control Resources Input



01 **PROJECT MANAGEMENT PLAN**
- Resource management plan

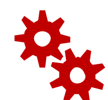
02 **PROJECT DOCUMENTS**
- Issue log
- Lessons learned register
- Physical resource assignments
- Project schedule
- Resource breakdown structure
- Resource requirements
- Risk register

03 **WORK PERFORMANCE DATA**

04 **AGREEMENTS**

05 **Organizational process assets**





9.6 Control Resources   Tools & Techniques



01 **DATA ANALYSIS**

- **Alternatives analysis**
- **Cost-benefit analysis**
- **Performance reviews.** compare, and analyze planned resource utilization to actual resource utilization.
- **Trend analysis.** examines project performance over time and can be used to determine whether performance is improving or deteriorating.

02 **PROBLEM SOLVING**

The project manager should use methodical steps to deal with problem solving,

1. **Identify the problem.** Specify the problem.
2. **Define the problem.** Break it into smaller, manageable problems.
3. **Investigate.** Collect data.
4. **Analyze.** Find the root cause of the problem.
5. **Solve.** Choose the suitable solution from a variety of available ones.
6. **Check the solution.** Determine if the problem has been fixed.







03 **INTERPERSONAL AND TEAM SKILLS**

sometimes known as “soft skills,” include:

- Negotiation.
- Influencing.

04 **PROJECT MANAGEMENT INFORMATION SYSTEM (PMIS)**






9.6 Control Resources Output



01 **WORK PERFORMANCE INFORMATION**

02 **CHANGE REQUESTS**

03 **PROJECT MANAGEMENT PLAN UPDATES**

- Resource management plan
- Schedule baseline
- Cost baseline

04 **PROJECT DOCUMENTS UPDATES**

- Assumption log
- Issue log
- Lessons learned register
- Physical resource assignments
- Resource breakdown structure
- Risk register





10. PROJECT COMMUNICATIONS MANAGEMENT



Presented by :
Abdulfattah Ajlan
Certified PMP Trainer

Project Communications Management





What is a Project Communications Management?

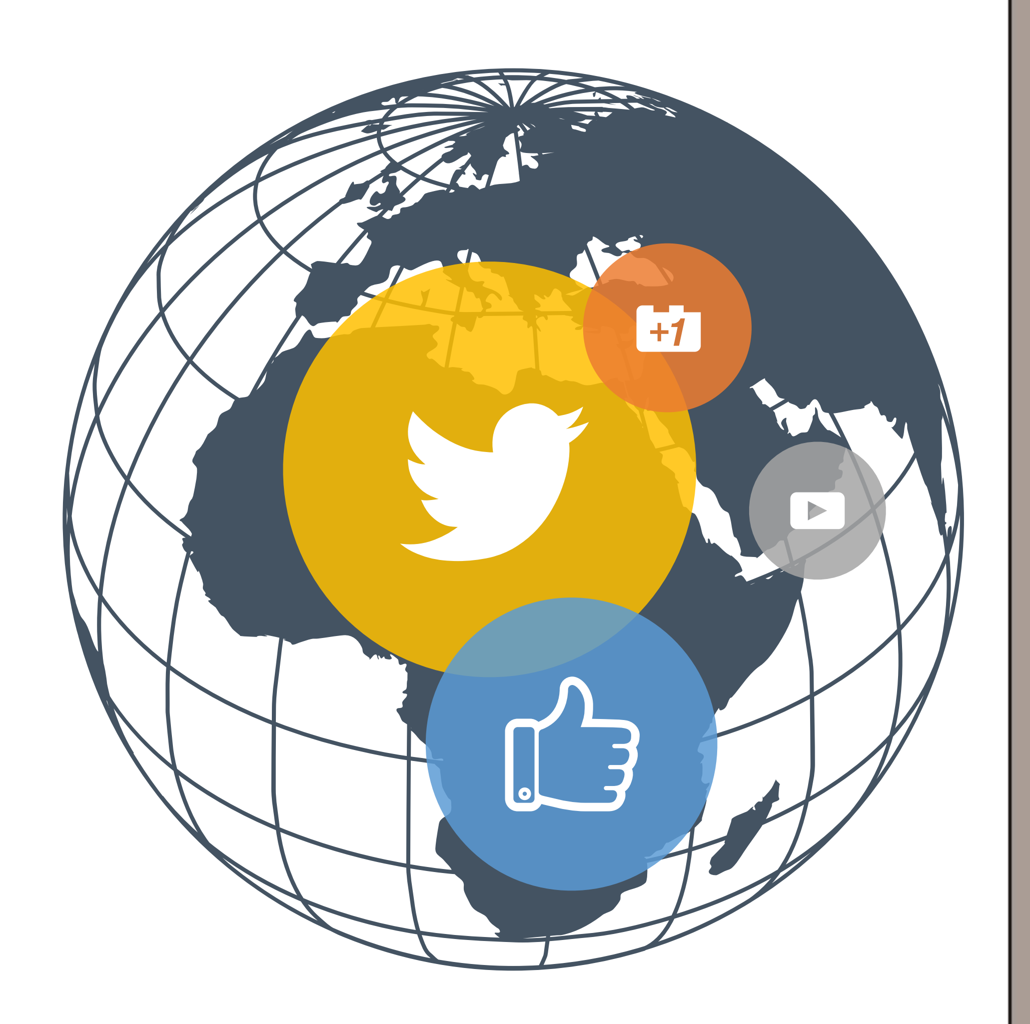
Includes the processes necessary to ensure that the information needs of the project and its stakeholders are met through development of artifacts and implementation of activities designed to achieve effective information exchange



Consists of two parts

The first part is developing a strategy to ensure communication is effective for stakeholders.

The second part is carrying out the activities necessary to implement the communication strategy





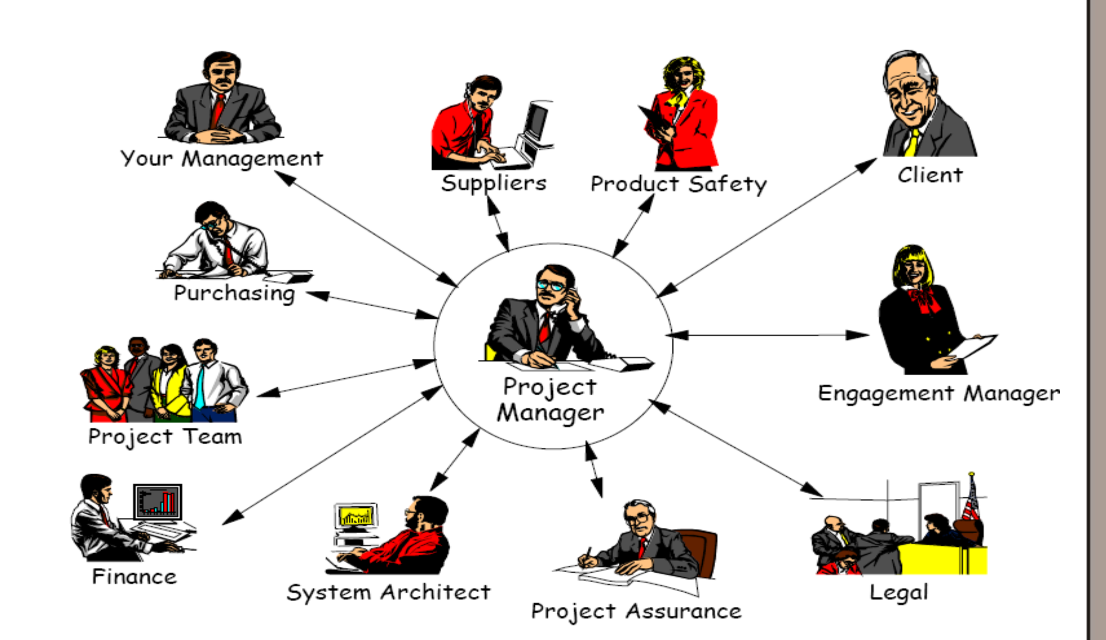
Key concepts for project communication management



- **Project managers** spend most of their time communicating with team members and other project stakeholders, both internal (at all organizational levels) and external to the organization

- Communication is the exchange of information, intended or involuntary. The information exchanged can be in the form of ideas, instructions, or emotions.

- Information can be sent or received, either through communication activities, such as meetings and presentations, or artifacts, such as emails, social media, project reports, or project documentation.



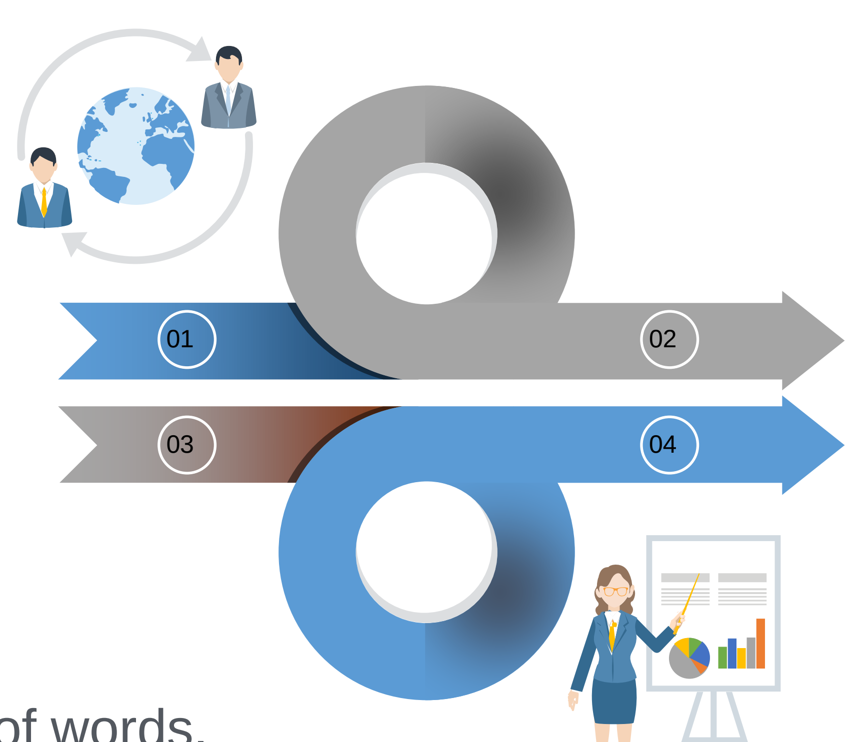


Key concepts for project communication management



Mechanisms of exchange Information

- **Written form**. Either physical or electronic.
- **Spoken**. Either face-to-face or remote.
- **Formal or informal** (as in formal papers or social media).
- **Through gestures.** Tone of voice and facial expressions.
- **Through media**. Pictures, actions, or even just the choice of words.





Key concepts for project communication management



Dimensions of communications

- **Internal & External**
- **Formal & Informal**
- **Hierarchical focus**
  - Upward: Senior management
  - Downward: The team
  - Horizontal: Peers of the project manager or team
- **Official & Unofficial**
- **Written & Oral**.



Knowledge Areas	Project Management Process Groups				
	Initiating	Planning	Executing	Monitoring and Controlling	Closing
Project Integration Management	4.1 Develop Project Charter	4.2 Develop Project Management Plan	4.3 Direct and Manage Project Work 4.4 Manage Project Knowledge	4.5 Monitor and Control Project Work 4.6 Perform Integrated Change Control	4.7 Close Project
Project Scope Management		5.1 Plan Scope Management 5.2 Collect Requirements 5.3 Define Scope 5.4 Create WBS		5.5 Validate Scope 5.6 Control Scope	
Project Schedule Management		6.1 Plan Schedule 6.2 Define Activities 6.3 Sequence Activities 6.4 Estimate Activity Durations 6.5 Develop Schedule Management		6.6 Control Schedule	
Project Cost Management		7.1 Plan Cost Management 7.2 Estimate Costs 7.3 Determine Budge		7.4 Control Costs	
Project Quality Management		8.1 Plan Quality Management	8.2 Manage Quality	8.3 Control Quality	
Project Resource Management		9.1 Plan Resource Management 9.2 Estimate Activity Resources	9.3 Acquire Resources 9.4 Develop Team 9.5 Manage Team	9.6 Control Resources	
Project Communications Management		10.1 Plan Communications Management	10.2 Manage Communications	10.3 Monitor Communications	
Project Risk Management		11.1 Plan Risk Management 11.2 Identify Risks 11.3 Perform Qualitative Risk Analysis 11.4 Perform Quantitative Risk Analysis 11.5 Plan Risk Responses	11.6 Implement Risk Responses	11.7 Monitor Risks	
Project Procurement Management		12.1 Plan Procurement Management	12.2 Conduct Procurements	12.3 Control Procurements	
Project Stakeholder Management	13.1 Identify Stakeholders	13.2 Plan Stakeholder Engagement	13.3 Manage Stakeholder Engagement	13.4 Monitor Stakeholder Engagement	

10.1 Plan communication management



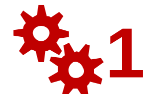


Is the process of developing an appropriate approach and plan for project communications activities **based on** the information needs of each stakeholder or group, available organizational assets, and the needs of the project.





The key benefit of this process is a documented approach to effectively and efficiently engage stakeholders by presenting relevant information in a timely manner.



10.1 Plan communication management

Legend:
New Item
Already Explained Item



Inputs, Tools & Techniques, and Outputs

Inputs		Tools & Techniques		Outputs	
Project charter	14	Expert judgment	35	Communications management plan	1
Project management plan (Resource management plan)	14	Communication requirements analysis	1	Project management plan updates (Stakeholder engagement plan)	6
Project management plan (Stakeholder engagement plan)	8	Communication technology	3	Project documents updates (Project schedule)	7
Project documents (Requirements documentation)	13	Communication models	1	Project documents updates (Stakeholder register)	12
Project documents (Stakeholder register)	17	Communication methods	2		
Enterprise environmental factors	40	Interpersonal and team skills (Communication styles assessment)	1		
Organizational process assets	47	Interpersonal and team skills (Political awareness)	5		
		Interpersonal and team skills (Cultural awareness)	4		
		Data representation (Stakeholder engagement assessment matrix)	4		
		Meetings	28		

10.1 Plan communication management



Data Flow Diagrams

10.1 Plan communication management Input:



01 Project charter

02 Project management plan
- Resource management plan
- Stakeholder engagement plan

03 Project documents
- Requirements documentation
- Stakeholder register

04 Enterprise environmental factors

05 Organizational process assets



10.1 Plan communication management Tools & Techniques



01 **Expert judgment**

02 **Communication requirements analysis**

Determines the information needed by the project stakeholders.

Sources of project communication requirements:

- Stakeholder register and stakeholder engagement plan
- Number of potential communication channels (one-to-one, one-to-many, and many-to-many).
- Organizational charts;
- Stakeholder responsibility, relationships, and interdependencies;
- Development approach;
- Disciplines, departments, and specialties involved in the project;
- Logistics of how many stakholders and their locations;
- Internal and External information
- Legal requirements.



10.1 Plan communication management Tools & Techniques



03 **Communication technology**

The **methods used** to transfer information among stakeholders.

Factors affect the choice of communication technology

- Urgency of the need for information.
- Availability and reliability of technology.
- Ease of use.
- Project environment.
- Sensitivity and confidentiality of the information.

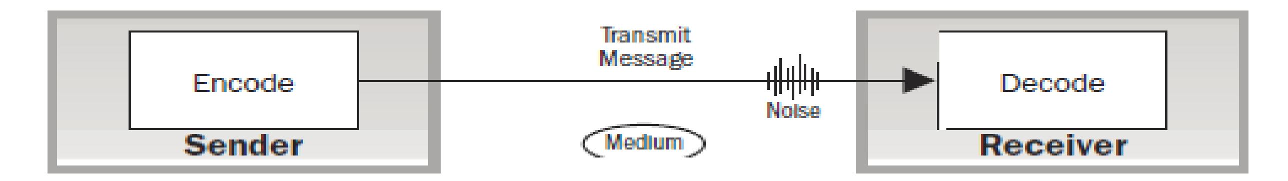


10.1 Plan communication management Tools & Techniques

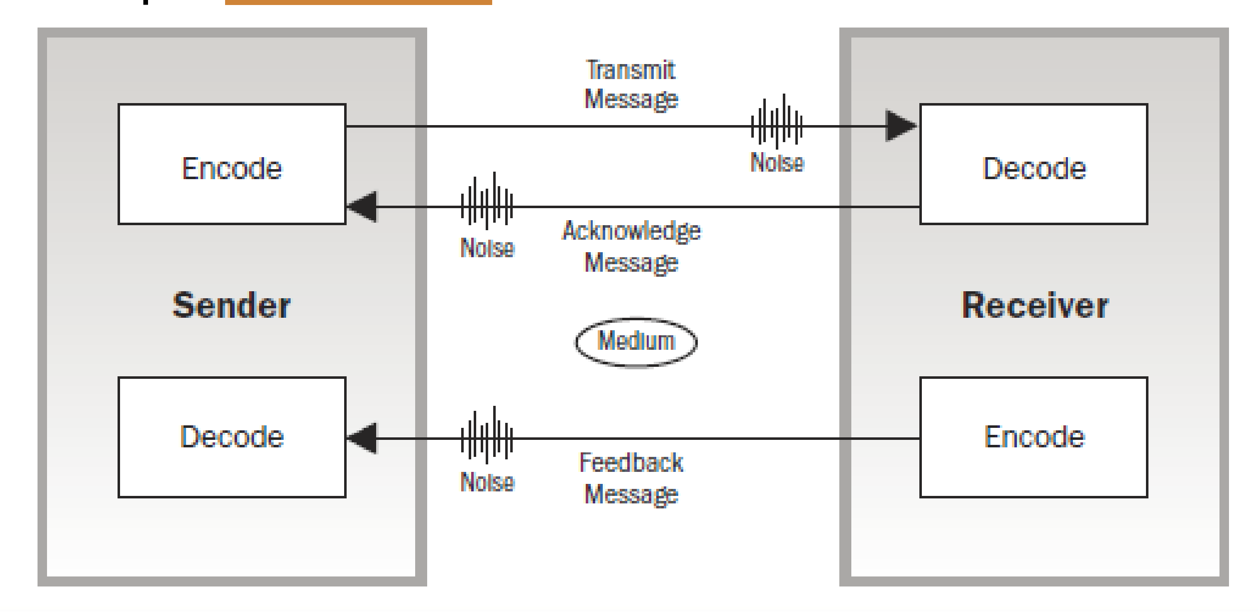


04 Communication models

Sample basic sender/receiver communication model.



Sample interactive communication model





10.1 Plan communication management Tools & Techniques



05 Communication Method

- Interactive communication: like Telephone call with feedback required.
- Push communication: Like sending an email.
- Pull communication: Like downloading a report from server or cloud folder.

06 Interpersonal and team skills

- **Communication styles assessment:**
  A technique to **identify** the preferred communication method, format, and content for stakeholders for planned communication activities.
- Political awareness
- Cultural awareness

07 Data representation

- **Stakeholder engagement assessment matrix (Stakeholder)**

08 Meetings







Data representation (Stakeholder engagement assessment matrix)

Stakeholder	Unaware	Resistant	Neutral	Supportive	Leading
Stakeholder 1	C			D	
Stakeholder 2			C	D	
Stakeholder 3				D C	

Figure 13-6. Stakeholder Engagement Assessment Matrix

C= Current Status **D= Desired Status**

10.1 Plan communication management Output:



01 **Communications management plan**

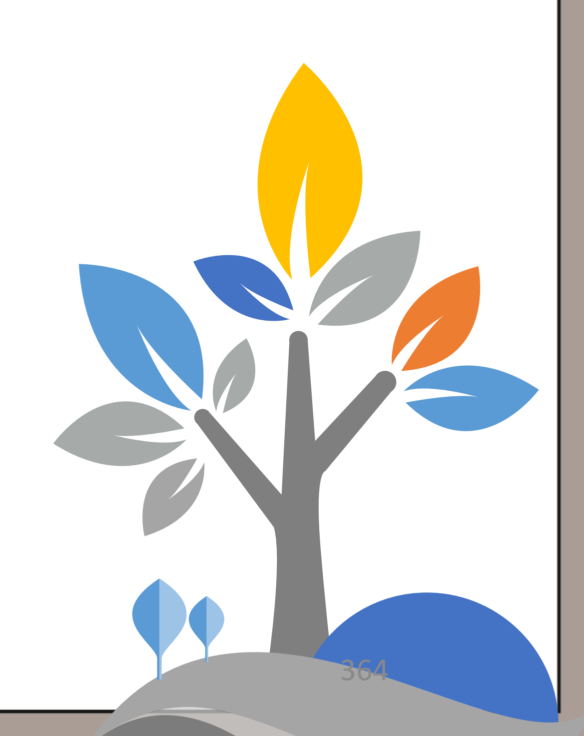
Describes how project communications will be planned, structured, implemented, and monitored **for effectiveness**

02 **Project management plan updates**

- Stakeholder engagement plan

03 **Project documents updates**

- Project schedule
- Stakeholder register





10.2 Manage Communications

Legend:
New Item
Already Explained Item



Inputs, Tools & Techniques, and Outputs

Inputs	
Project management plan (Resource management plan)	14
Project management plan (Communications management plan)	7
Project management plan (Stakeholder engagement plan)	8
Project documents (Change log)	6
Project documents (Issue log)	12
Project documents (Lessons learned register)	27
Project documents (Quality reports)	5
Project documents (Risk report)	10
Project documents (Stakeholder register)	17
Work performance reports	4
Enterprise environmental factors	40
Organizational process assets	47

Tools & Techniques	
Communication technology	3
Communication methods	2
Communication skills (Communication competence)	1
Communication skills (Feedback)	3
Communication skills (Nonverbal)	1
Communication skills (Presentations)	2
Project management information system	12
Project reporting	1
Interpersonal and team skills (Active listening)	3
Interpersonal and team skills (Conflict management)	6
Interpersonal and team skills (Cultural awareness)	4
Interpersonal and team skills (Meeting management)	3
Interpersonal and team skills (Networking)	3
Interpersonal and team skills (Political awareness)	5
Meetings	28

Outputs	
Project communications	1
Project management plan updates (Communications management plan)	6
Project management plan updates (Stakeholder engagement plan)	6
Project documents updates (Issue log)	14
Project documents updates (Lessons learned register)	29
Project documents updates (Project schedule)	7
Project documents updates (Risk register)	23
Project documents updates (Stakeholder register)	12
Organizational process assets updates	10



10.2 Manage Communications

Data Flow Diagrams

Project Management Plan

Project management plan
- Resource management plan
- Communications management plan
- Stakeholder engagement plan

Project Documents

Project documents
- Change log
- Issue log
- Lessons learned register
- Quality report
- Risk report
- Stakeholder register

4.5 Monitor and Control Project Work

- Work performance reports

Enterprise/ Organization

- Enterprise environmental factors
- Organizational process assets

10.2 Manage Communications

- Project communications

Project Documents

Project documents updates
- Issue log
- Lessons learned register
- Project schedule
- Risk register
- Stakeholder register

Project Management Plan

Project management plan updates
- Communications management plan
- Stakeholder engagement plan

Enterprise/ Organization

- Organizational process assets updates



10.2 Manage Communications Input:



01 **Project management plan**

- Resource management plan
- Communications management plan
- Stakeholder engagement plan

02 **Project documents**

- Change log
- Issue log
- Risk report
- Lessons learned register
- Quality report
- Stakeholder register



03 **Work performance reports**

04 **Enterprise environmental factors**

05 **Organizational process assets**

10.2 Manage Communications   Tools & Techniques



01 **Communication technology**

02 **Communication methods**

03 **Communication skills**

- Communication competence: a combination of tailored communication skills.
- Feedback: is information about reactions to communications.
- Nonverbal: body language, tone of voice, and facial expressions
- Presentations: formal delivery of information and/or documentation.

04 **Project management information system**

05 **Project reporting**: is the act of collecting and distributing project information







06 Interpersonal and team skills

- Active listening
- Conflict management
- Cultural awareness
- Meeting management
- Networking
- Political awareness

07 Meetings



10.2 Manage Communications



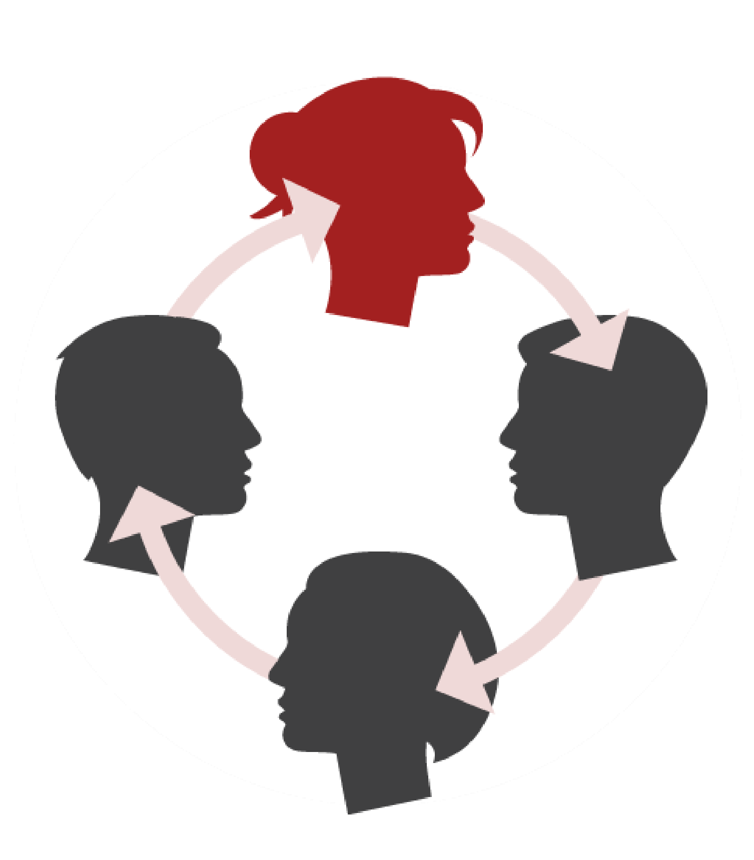


01 **Project communications**

02 **Project management plan updates**
- Communications management plan
- Stakeholder engagement plan

03 **Project documents updates**
- Issue log
- Lessons learned register
- Project schedule
- Risk register
- Stakeholder register







10.3 Monitor Communications

Legend:
New Item
Already Explained Item

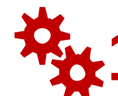


Inputs, Tools & Techniques, and Outputs

Inputs		Tools & Techniques		Outputs	
Project management plan (Resource management plan)	14	Expert judgment	35	Work performance information	10
Project management plan (Communications management plan)	7	Project management information system	12	Change requests	24
Project management plan (Stakeholder engagement plan)	8	Data representation (Stakeholder engagement assessment matrix)	4	Project management plan updates (Communications management plan)	6
Project documents (Issue log)	12	Interpersonal and team skills (Observation/conversation)	3	Project management plan updates (Stakeholder engagement plan)	6
Project documents (Lessons learned register)	27	Meetings	28	Project documents updates (Issue log)	14
Project documents (Project communications)	4			Project documents updates (Lessons learned register)	29
Work performance data	10			Project documents updates (Stakeholder register)	12
Enterprise environmental factors	40				
Organizational process assets	47				







10.3 Monitor Communications



Data Flow Diagrams

Project Management Plan

Project management plan
- Resource management plan
- Communications management plan
- Stakeholder engagement plan

Project Documents

Project documents
- Issue log
- Lessons learned register
- Project communications

4.3 Direct and Manage Project Work

- Work performance data

Enterprise/ Organization

- Enterprise environmental factors
- Organizational process assets

10.3 Monitor Communications

4.5 Monitor and Control Project Work

- Work performance information

4.6 Perform Integrated Change Control

- Change requests

Project Management Plan

Project management plan updates
- Communications management plan
- Stakeholder engagement plan

Project Documents

Project documents updates:
- Issue log
- Lessons learned register
- Stakeholder register

10.3 Monitor Communications Input:



01 **Project management plan**
- Resource management plan
- Communications management plan
- Stakeholder engagement plan

02 **Project documents**
- Issue log
- Lessons learned register
- Project communications

03 **Work performance data**

04 **Enterprise environmental factors**

05 **Organizational process assets**







01 **Expert judgment**

02 **Project management information system**

03 **Data representation**

- **Stakeholder engagement assessment matrix**

04 **Interpersonal and team skills**

- Observation/conversation

05 **Meetings**



Stakeholder	Unaware	Resistant	Neutral	Supportive	Leading
Stakeholder 1	C			D	
Stakeholder 2			C	D	
Stakeholder 3				D C	

Figure 13-6. Stakeholder Engagement Assessment Matrix

10.3 Monitor Communications





01 **Work performance information**

02 **Change requests**

03 **Project management plan updates**
- Communications management plan
- Stakeholder engagement plan

04 **Project documents updates**
- Issue log
- Lessons learned register
- Stakeholder register





11. PROJECT RISK MANAGEMENT



Presented by :

Abdulfattah Ajlan

Certified PMP Trainer

What is The objectives of project risk management?!



Project Risk Management

Project Risk Management includes the processes of conducting risk management planning, identification, analysis, response planning, response implementation, and monitoring risk on a project.

The objectives of project risk management are to **increase** the probability and/or impact of **positive risks** and to **decrease** the probability and/or impact of **negative risks**, in order to optimize the chances of project success.



Key concepts for Project Risk Management





- Project Risk Management processes address **two levels** of risk in projects:
  - **Individual project risk:** uncertain event that, if it occurs, has a positive or negative effect on one or more project objectives.
  - **Overall project risk:** uncertain event on the project as a whole, affect the project outcome, both positive or negative.

- **Risk thresholds** express the degree of acceptable variation around a project objective.

- Project team needs to know what **level of risk** exposure is **acceptable** in pursuit of the project objectives. (Risk thresholds).

Key concepts for Project Risk Management

Thresholds

Tolerance Levels

Risk Appetite Statement

Definitions

- **Risk appetite** a general, **high-level** description of the acceptable level of risk. → The organization accept award risky urgent project (may subjected to loss profit)
- **Risk tolerance** the **degree**, **amount**, or **volume** of risk that an organization or individual will accept. → The organization allow the schedule and cost slippage 5% to 10%
- **Risk threshold** the specific **point** at which risk becomes **unacceptable** → The organization can't accept risk with impact more than 50,000 SR

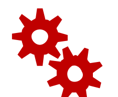
Knowledge Areas	Project Management Process Groups				
	Initiating	Planning	Executing	Monitoring and Controlling	Closing
Project Integration Management	4.1 Develop Project Charter	4.2 Develop Project Management Plan	4.3 Direct and Manage Project Work 4.4 Manage Project Knowledge	4.5 Monitor and Control Project Work 4.6 Perform Integrated Change Control	4.7 Close Project
Project Scope Management		5.1 Plan Scope Management 5.2 Collect Requirements 5.3 Define Scope 5.4 Create WBS		5.5 Validate Scope 5.6 Control Scope	
Project Schedule Management		6.1 Plan Schedule 6.2 Define Activities 6.3 Sequence Activities 6.4 Estimate Activity Durations 6.5 Develop Schedule Management		6.6 Control Schedule	
Project Cost Management		7.1 Plan Cost Management 7.2 Estimate Costs 7.3 Determine Budge		7.4 Control Costs	
Project Quality Management		8.1 Plan Quality Management	8.2 Manage Quality	8.3 Control Quality	
Project Resource Management		9.1 Plan Resource Management 9.2 Estimate Activity Resources	9.3 Acquire Resources 9.4 Develop Team 9.5 Manage Team	9.6 Control Resources	
Project Communications Management		10.1 Plan Communications Management	10.2 Manage Communications	10.3 Monitor Communications	
Project Risk Management		11.1 Plan Risk Management 11.2 Identify Risks 11.3 Perform Qualitative Risk Analysis 11.4 Perform Quantitative Risk Analysis 11.5 Plan Risk Responses	11.6 Implement Risk Responses	11.7 Monitor Risks	
Project Procurement Management		12.1 Plan Procurement Management	12.2 Conduct Procurements	12.3 Control Procurements	
Project Stakeholder Management	13.1 Identify Stakeholders	13.2 Plan Stakeholder Engagement	13.3 Manage Stakeholder Engagement	13.4 Monitor Stakeholder Engagement	



CONSIDERATIONS FOR AGILE/ADAPTIVE ENVIRONMENTS

High-variability environments, by definition, **incur more uncertainty and risk**. How to address it?

- PM using adaptive approaches Have to accelerate knowledge sharing to **ensure that risk is understood and managed**.
- Risk is considered when selecting the content of each iteration, and **risks** will also be **identified**, **analyzed**, and **managed** during each iteration.
- Work may be re-prioritized as the project progressing, based on an **improved understanding** of current risk exposure.



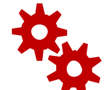
11.1 Plan Risk Management

Legend:
New Item
Already Explained Item



Inputs, Tools & Techniques, and Outputs

Inputs		Tools & Techniques		Outputs	
Project charter	14	Expert judgment	35	Risk management plan	1
Project management plan (All components)	3	Data analysis (Stakeholder analysis)	3		
Project documents (Stakeholder register)	17	Meetings	28		
Enterprise environmental factors	40				
Organizational process assets	47				



11.1 Plan Risk Management



Data Flow Diagrams

4.1
Develop Project Charter

- Project charter

Project Management Plan

Project management plan
- All components

Project Documents

Project documents
- Stakeholder register

Enterprise/ Organization

- Enterprise environmental factors
- Organizational process assets

11.1
Plan Risk Management

- Risk management plan

Project Management Plan



Input



01 **PROJECT CHARTER**

02 **PROJECT MANAGEMENT PLAN**

- All components

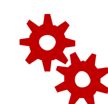
03 **PROJECT DOCUMENTS**

- Stakeholder register

04 **ENTERPRISE ENVIRONMENTAL FACTORS**

05 **ORGANIZATIONAL PROCESS ASSETS**





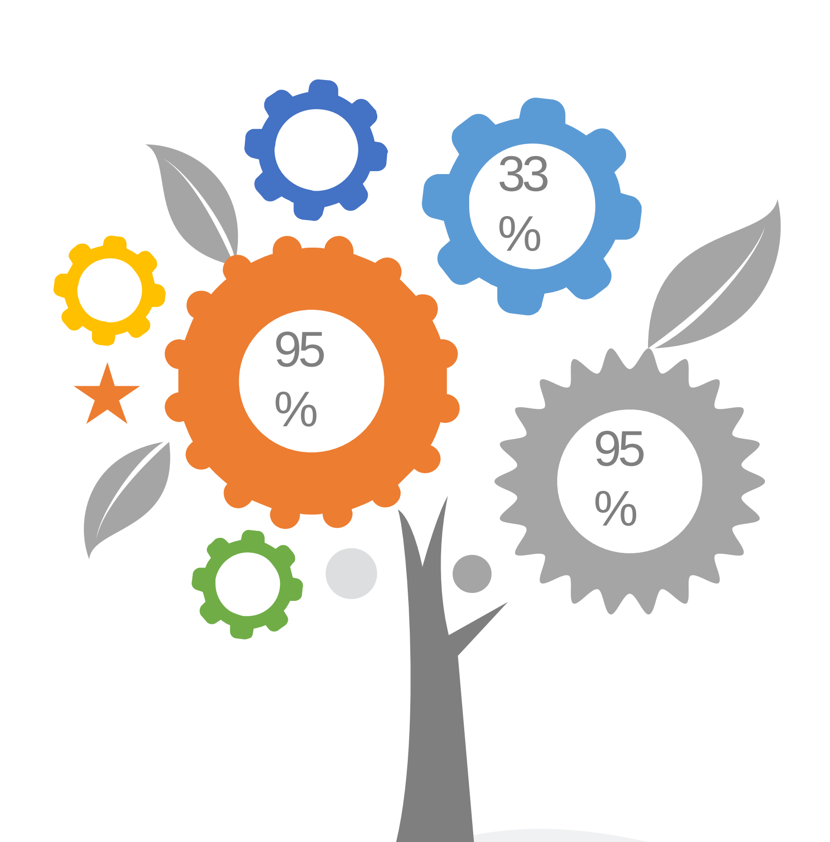
11.1 Plan Risk Management Tools & Techniques



01 **EXPERT JUDGMENT**

02 **DATA ANALYSIS**

03 **Meetings**



11.1 Plan Risk Management Output



01 **RISK MANAGEMENT PLAN**

Describes how risk management **activities** will be structured and performed.

- **Risk strategy**. general approach to managing risk on this project.
- **Methodology**. specific approaches, tools, and data sources that will be used to perform risk management on the project.
- **Roles and responsibilities**. The risk management team for each activity and their responsibilities.
- **Funding**. The funds needed to perform activities related to Project Risk Management
- **Timing**. When the Project Risk Management processes will be performed.
- **Risk categories**. Grouping individual project risks using a risk breakdown structure (RBS).

11.1 Plan Risk Management Output



Risk categories.

Risk Breakdown Structure (RBS)

RBS LEVEL 0	RBS LEVEL 1	RBS LEVEL 2
0. ALL SOURCES OF PROJECT RISK	1. TECHNICAL RISK	1.1 Scope definition
		1.2 Requirements definition
		1.3 Estimates, assumptions, and constraints
		1.4 Technical processes
		1.5 Technology
		1.6 Technical interfaces
		Etc.
	2. MANAGEMENT RISK	2.1 Project management
		2.2 Program/portfolio management
		2.3 Operations management
		2.4 Organization
		2.5 Resourcing
		2.6 Communication
		Etc.
	3. COMMERCIAL RISK	3.1 Contractual terms and conditions
		3.2 Internal procurement
		3.3 Suppliers and vendors
		3.4 Subcontracts
		3.5 Client/customer stability
		3.6 Partnerships and joint ventures
		Etc.
	4. EXTERNAL RISK	4.1 Legislation
		4.2 Exchange rates
		4.3 Site/facilities
		4.4 Environmental/weather
		4.5 Competition
		4.6 Regulatory
		Etc.



11.1 Plan Risk Management Output



- **Stakeholder risk appetite.** The risk appetites of key stakeholders on the project are recorded in the risk management plan, as they inform the details of the Plan Risk Management process stakeholder risk appetite should be expressed as measurable risk thresholds

- **Definitions of risk probability and impacts.** used to evaluate both threats and opportunities by interpreting the impact definitions as negative for threats (delay, additional cost, and performance shortfall) and positive for opportunities (reduced time or cost, and performance enhancement).

SCALE	PROBABILITY	+/− IMPACT ON PROJECT OBJECTIVES		
		TIME	COST	QUALITY
Very High	>70%	>6 months	>$5M	Very significant impact on overall functionality
High	51-70%	3-6 months	$1M-$5M	Significant impact on overall functionality
Medium	31-50%	1-3 months	$501K-$1M	Some impact in key functional areas
Low	11-30%	1-4 weeks	$100K-$500K	Minor impact on overall functionality
Very Low	1-10%	1 week	<$100K	Minor impact on secondary functions
Nil	<1%	No change	No change	No change in functionality

11.1 Plan Risk Management Output



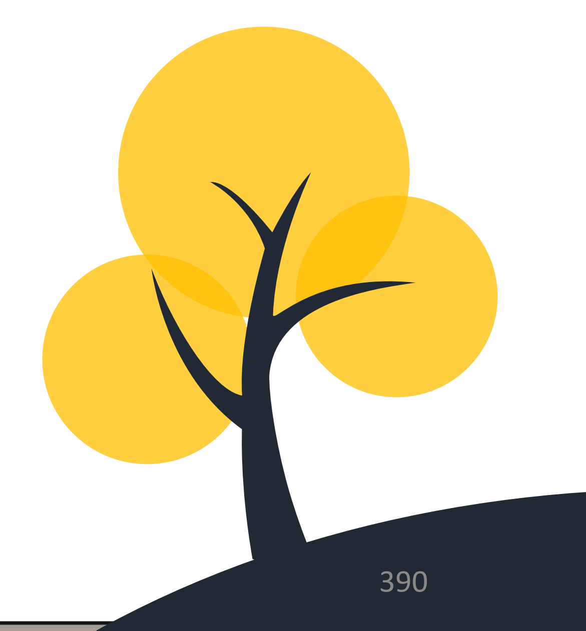
- **Probability and impact matrix.** Opportunities and threats are represented in a common probability and impact matrix using positive definitions of impact for opportunities and negative impact definitions for threats. Where numeric values are used, these can be multiplied to give a **probability-impact score** for each risk,

Probability	Threats					Opportunities					Probability
Very High 0.90	0.05	0.09	0.18	0.36	0.72	0.72	0.36	0.18	0.09	0.05	Very High 0.90
High 0.70	0.04	0.07	0.14	0.28	0.56	0.56	0.28	0.14	0.07	0.04	High 0.70
Medium 0.50	0.03	0.05	0.10	0.20	0.40	0.40	0.20	0.10	0.05	0.03	Medium 0.50
Low 0.30	0.02	0.03	0.06	0.12	0.24	0.24	0.12	0.06	0.03	0.02	Low 0.30
Very Low 0.10	0.01	0.01	0.02	0.04	0.08	0.08	0.04	0.02	0.01	0.01	Very Low 0.10
	Very Low 0.05	Low 0.10	Moderate 0.20	High 0.40	Very High 0.80	Very High 0.80	High 0.40	Moderate 0.20	Low 0.10	Very Low 0.05	
	Negative Impact					Positive Impact					

11.1 Plan Risk Management Output



- **Reporting formats.** Reporting formats define **how the outcomes of the Project Risk** Management process will be documented, analyzed, and communicated.
- **Tracking.** Tracking documents:
  How risk activities will be **recorded** and
  How risk management processes will be **audited**.





11.2 Identify Risks

Legend:
New Item
Already Explained Item



Inputs, Tools & Techniques, and Outputs

Inputs	
Project management plan (Requirements management plan)	7
Project management plan (Schedule management plan)	7
Project management plan (Cost management plan)	4
Project management plan (Quality management plan)	7
Project management plan (Resource management plan)	14
Project management plan (Risk management plan)	12
Project management plan (Scope baseline)	16
Project management plan (Schedule baseline)	5
Project management plan (Cost baseline)	7
Project documents (Assumption log)	14
Project documents (Cost estimates)	4
Project documents (Duration estimates)	3
Project documents (Issue log)	12
Project documents (Lessons learned register)	27
Project documents (Requirements documentation)	13
Project documents (Resource requirements)	8
Project documents (Stakeholder register)	17
Agreements	11
Procurement documentation	4
Enterprise environmental factors	40
Organizational process assets	47

Tools & Techniques	
Expert judgment	35
Data gathering (Brainstorming)	6
Data gathering (Checklists)	4
Data gathering (Interviews)	8
Data analysis (Root cause analysis)	6
Data analysis (Assumption and constraint analysis)	2
Data analysis (SWOT analysis)	1
Data analysis (Document analysis)	5
Interpersonal and team skills (Facilitation)	9
Prompt lists	1
Meetings	28

Outputs	
Risk register	1
Risk report	1
Project documents updates (Assumption log)	17
Project documents updates (Issue log)	14
Project documents updates (Lessons learned register)	29



11.2 Identify Risks



Data Flow Diagrams

11.2 Identify Risks Input



01 **PROJECT MANAGEMENT PLAN**

- Requirements management plan
- Schedule management plan
- Cost management plan
- Quality management plan
- Resource management plan
- Risk management plan
- Scope baseline
- Schedule baseline
- Cost baseline

02 **PROJECT DOCUMENTS**

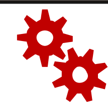
- Assumption log
- Cost estimates
- Duration estimates
- Issue log
- Lessons learned register
- Requirements documentation
- Resource requirements
- Stakeholder register

03 **AGREEMENTS**

04 **PROCUREMENT DOCUMENTATION**

05 **ENTERPRISE ENVIRONMENTAL FACTORS**

06 **ORGANIZATIONAL PROCESS ASSETS**



11.2 Identify Risks Tools & Techniques



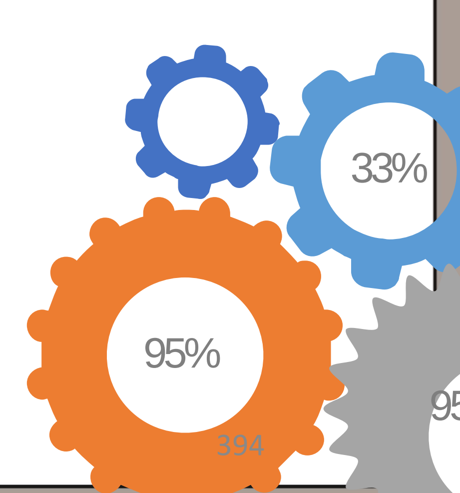
01 **EXPERT JUDGMENT**

02 **DATA GATHERING**

- **Brainstorming.** to obtain a comprehensive list of individual project risks and sources of overall project risk.
- **Checklists.** developed based on historical information and knowledge that has been accumulated from similar projects and from other sources of information.
- **Interviews.** interviewing experienced participants, stakeholders, and subject matter experts to identify risks

03 **DATA ANALYSIS**

- **Root cause analysis.** to discover the underlying causes that lead to a problem, and develop preventive action.
- **Assumption and constraint analysis.** To explores the validity of assumptions and constraints to determine which pose a risk to the project
- **SWOT analysis.** examines the project from each of the strengths, weaknesses, opportunities, and threats (SWOT) perspectives.
- **Document analysis.**





Strengths	Weakness
list your: + advantages + unique and low-cost resources + factors mean that you "get the sale"	list your: + disadvantages, limitations + what could you improve + factors lose you sales

Internal

SWOT

Opportunities	Threats
list your: + chances to improve performance + good opportunities can you spot	list your: + external trouble for the business + obstacles do you face + what your competitors are doing

External



11.2 Identify Risks

Tools & Techniques



04 **INTERPERSONAL AND TEAM SKILLS (Facilitation)**

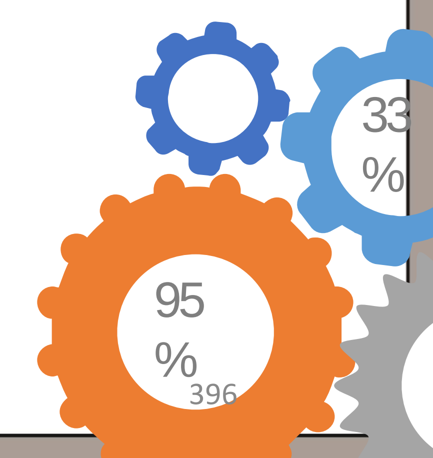
05 **PROMPT LISTS**

A prompt list is a predetermined list of risk categories that might give rise to individual project risks and that could also act as sources of overall project risk.

common strategic frameworks for identifying sources of overall project risk

- **PESTLE** (political, economic, social, technological, legal, environmental),
- **TECOP** (technical, environmental, commercial, operational, political), or
- **VUCA** (volatility, uncertainty, complexity, ambiguity).

06 **MEETINGS**
(often called a risk workshop).



11.2 Identify Risks Output



01 **RISK REGISTER**

The risk register captures details of identified **individual project risks**. include :

- List of identified risks.
- Potential risk owners.
- List of potential risk responses.

It is continuously **reviewed throughout the project**.



02 **RISK REPORT:**

Presents information on **sources of overall project risk**, together with summary information on identified individual project risks.

03 **PROJECT DOCUMENTS UPDATES**

- Assumption log.
- Issue log..
- Lessons learned register

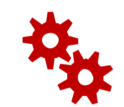
11.2 Identify Risks Output



Risk Register

Risk ID	Risk	Responses	Root Cause	Categories
R001	Threat of Being Hacked	Fireqall; Intrusion Detection SW	Poorly designed security; Outdated tech	Security

Fragment of Risk Register



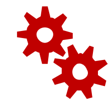
11.3 Perform Qualitative Risk Analysis

Legend:
New Item
Already Explained Item



Inputs, Tools & Techniques, and Outputs

Inputs		Tools & Techniques		Outputs	
Project management plan (Risk management plan)	12	Expert judgment	35	Project documents updates (Assumption log)	17
Project documents (Assumption log)	14	Data gathering (Interviews)	8	Project documents updates (Issue log)	14
Project documents (Risk register)	22	Data analysis (Risk data quality assessment)	1	Project documents updates (Risk register)	23
Project documents (Stakeholder register)	17	Data analysis (Risk probability and impact assessment)	1	Project documents updates (Risk report)	5
Enterprise environmental factors	40	Data analysis (Assessment of other risk parameters)	1		
Organizational process assets	47	Interpersonal and team skills (Facilitation)	9		
		Risk categorization	1		
		Data representation (Probability and impact matrix)	1		
		Data representation (Hierarchical charts)	2		
		Meetings	28		



11.3 Perform Qualitative Risk Analysis



Data Flow Diagrams

Project Management Plan

Project management plan
- Risk management plan

Project Documents

Project documents
- Assumption log
- Risk register
- Stakeholder register

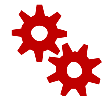
Enterprise/ Organization

- Enterprise environmental factors
- Organizational process assets

11.3 Perform Qualitative Risk Analysis

Project documents updates
- Assumption log
- Issue log
- Risk register
- Risk report

Project Documents



11.3 Perform Qualitative Risk Analysis Input



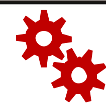
01 **PROJECT MANAGEMENT PLAN**
- Risk management plan

02 **PROJECT DOCUMENTS**
- Assumption log
- Risk register
- Stakeholder register

03 **ENTERPRISE ENVIRONMENTAL FACTORS**

04 **ORGANIZATIONAL PROCESS ASSETS**





11.3 Perform Qualitative Risk Analysis Tools & Techniques



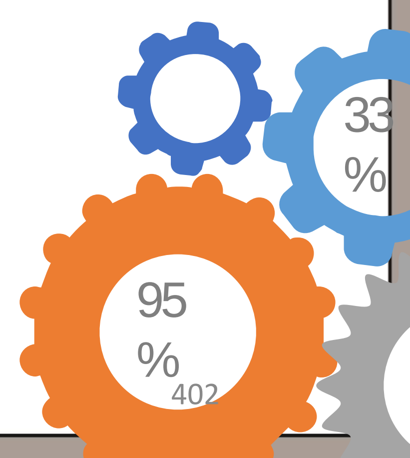
01 **EXPERT JUDGMENT**

02 **DATA GATHERING**

03 **DATA ANALYSIS**

Risk data quality assessment: evaluates the degree to which the data about individual project risks is **accurate** and **reliable** as a basis for qualitative risk analysis.

Risk probability and impact assessment: considers the likelihood that a specific risk will occur and considers the potential effect on project objectives (schedule, cost, quality, or performance). Impacts will be negative for threats and positive for opportunities.



11.3 Perform Qualitative Risk Analysis Tools & Techniques



Assessment of other risk parameters.

Consider other characteristics of risk, like:

- **Urgency**. The period of time within which a response to the risk is to be implemented in order to be effective. (A short period indicates high urgency.) (Ex. Storms lead to Power Outage)
- **Proximity**. The period of time before the risk might have an impact on one or more project objectives. (A short period indicates high proximity.) (Ex. Delay order).
- **Dormancy**. The period of time that may elapse after a risk has occurred before its impact is discovered. (A short period indicates low dormancy.) (Ex. Quit of quality employee).
- **Manageability**. The ease with which the risk owner can manage the occurrence or impact of risk.
- **Detectability**. The ease with which the results of the risk occurring, or being about to occur, can be detected and recognized.
- **Controllability**. The degree to which the risk owner is able to control the risk's outcome.
- **Connectivity**. The extent to which the risk is related to other individual project risks.
- **Strategic impact**. The potential for the risk to have a positive or negative effect on the organization's strategic goals
- **Propinquity**. The degree to which a risk is perceived to matter by one or more stakeholders. Where a risk is perceived as very significant, propinquity is high.

11.3 Perform Qualitative Risk Analysis Tools & Techniques



04 **INTERPERSONAL AND TEAM SKILLS (**Facilitation)

05 **RISK CATEGORIZATION**

Risks to the project can be categorized by sources of risk (RBS); or other useful categories (e.g., project phase, project budget, and roles and responsibilities)

06 **DATA REPRESENTATION**

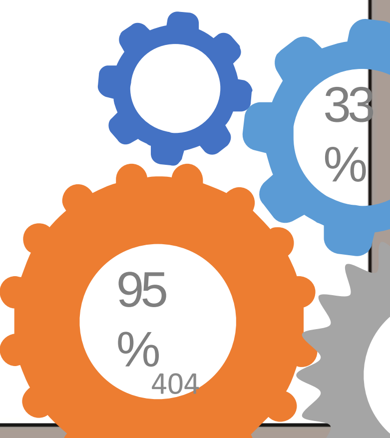
- ✓ **Probability and impact matrix.**

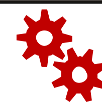
  Is a grid for mapping the probability of each risk occurrence and its impact on project objectives if that risk occurs

- ✓ **Hierarchical Charts**

  Where risks have been categorized using more than two parameters.
  Ex: Bubble chart which displays three dimensions of data, where each risk is plotted (bubble), and the three parameters are represented by the x-axis value, the y-axis value, and the bubble size.

07 **MEETINGS**



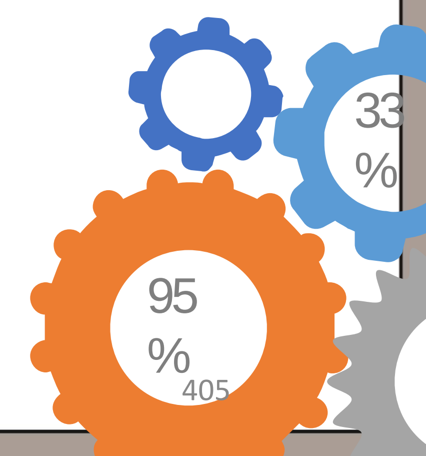


11.3 Perform Qualitative Risk Analysis Tools & Techniques



		Impact				
		Trivial	Minor	Moderate	Major	Extreme
Probability	Rare	Low	Low	Low	Medium	Medium
	Unlikely	Low	Low	Medium	Medium	Medium
	Moderate	Low	Medium	Medium	Medium	High
	Likely	Medium	Medium	Medium	High	High
	Very likely	Medium	Medium	High	High	High

Probability and impact matrix



11.3 Perform Qualitative Risk Analysis Tools & Techniques



Bubble size – Impact Value

High

Proximity

Low

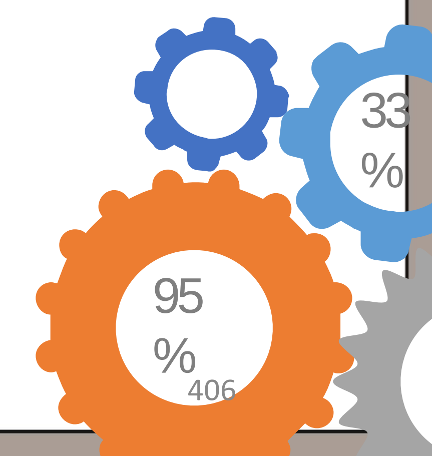
Low

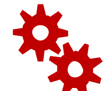
Detectability

High

Large bubbles in this area are unacceptable

Small bubbles in this area are acceptable





11.3 Perform Qualitative Risk Analysis

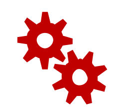
Output



01 **PROJECT DOCUMENTS UPDATES**

- Assumption log
- Issue log
- Risk register
- Risk report





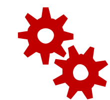
11.4 Perform Quantitative Risk Analysis

Legend:
New Item
Already Explained Item



Inputs, Tools & Techniques, and Outputs

Inputs		Tools & Techniques		Outputs	
Project management plan (Risk management plan)	12	Expert judgment	35	Project documents updates (Risk report)	5
Project management plan (Scope baseline)	16	Data gathering (Interviews)	8		
Project management plan (Schedule baseline)	5	Interpersonal and team skills (Facilitation)	9		
Project management plan (Cost baseline)	7	Representations of uncertainty	1		
Project documents (Assumption log)	14	Data analysis (Simulation)	2		
Project documents (Basis of estimates)	6	Data analysis (Sensitivity analysis)	1		
Project documents (Cost estimates)	4	Data analysis (Decision tree analysis)	1		
Project documents (Cost forecasts)	2	Data analysis (Influence diagrams)	1		
Project documents (Duration estimates)	3				
Project documents (Milestone list)	9				
Project documents (Resource requirements)	8				
Project documents (Risk register)	22				
Project documents (Risk report)	10				
Project documents (Schedule forecasts)	2				
Enterprise environmental factors	40				
Organizational process assets	47				



11.4 Perform Quantitative Risk Analysis



Data Flow Diagrams

Project Management Plan

Project management plan
- Risk management plan
- Scope baseline
- Schedule baseline
- Cost baseline

Project Documents

Project documents
- Assumption log
- Basis of estimates
- Cost estimates
- Cost forecasts
- Duration estimates
- Milestone list
- Resource requirements
- Risk register
- Risk report
- Schedule forecasts

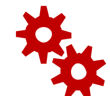
Enterprise/ Organization

- Enterprise environmental factors
- Organizational process assets

11.4 Perform Quantitative Risk Analysis

Project Documents

Project documents updates
- Risk report



11.4 Perform Quantitative Risk Analysis Input



01 **PROJECT MANAGEMENT PLAN**

- Risk management plan
- Scope baseline
- Schedule baseline
- Cost baseline

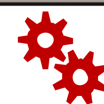
02 **PROJECT DOCUMENTS**

- Assumption log
- Basis of estimates
- Cost estimates
- Cost forecasts
- Duration estimates
- Milestone list
- Resource requirements
- Risk register
- Risk report
- Schedule forecasts

03 **ENTERPRISE ENVIRONMENTAL FACTORS**

04 **ORGANIZATIONAL PROCESS ASSETS**





11.4 Perform Quantitative Risk Analysis Tools & Techniques



01 **EXPERT JUDGMENT**

02 **DATA GATHERING**

03 **INTERPERSONAL AND TEAM SKILLS**

04 **REPRESENTATIONS OF UNCERTAINTY**

Representations of an individual project's risks, such as time, cost, or other resources.

This may take several forms. triangular, normal, lognormal, beta, uniform, or discrete distributions.



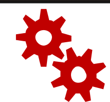
Care should be taken when selecting an appropriate probability distribution to reflect the range of possible values for the planned activity.



05 **DATA ANALYSIS**

Simulation. Simulates the combined effects of individual project risks and other sources of uncertainty to evaluate their potential impact on achieving project objectives performed using a Monte Carlo analysis. (EX. Impact Covid-19 on schedule and cost of project), studying the probability of complete the project within specific time and cost)

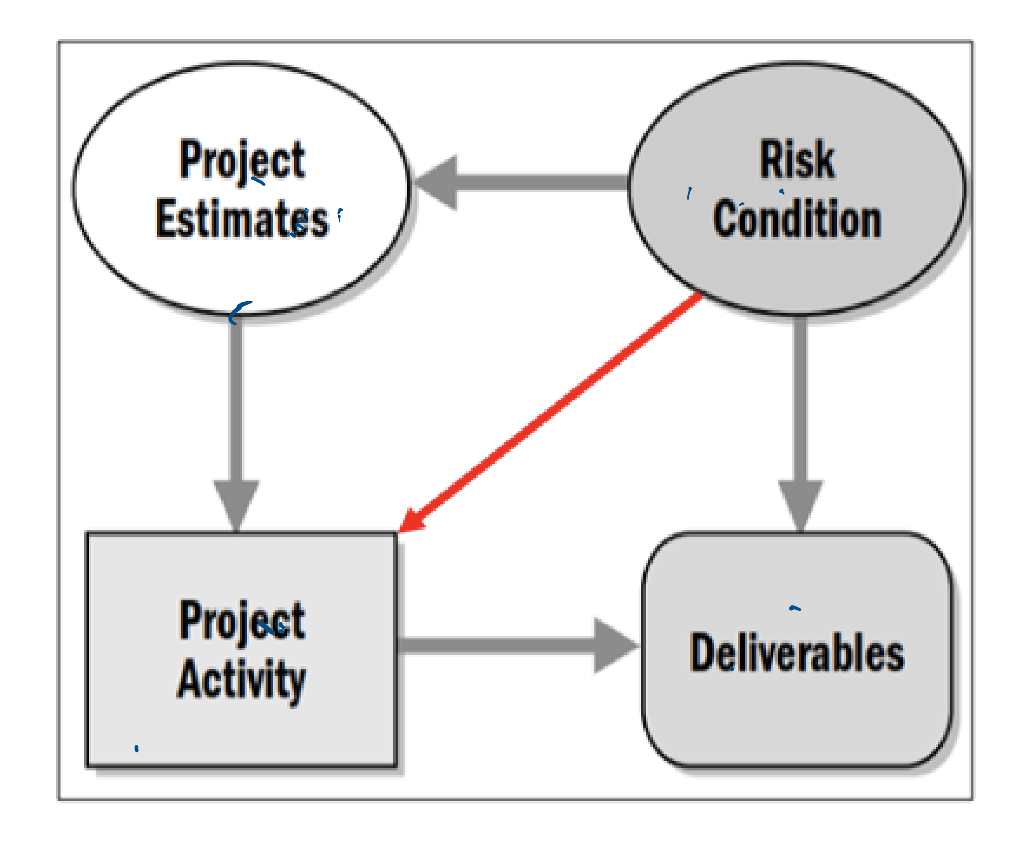
95 %

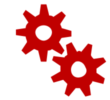


11.4 Perform Quantitative Risk Analysis Tools & Techniques



Influence diagrams. represents a project or situation within the project as a set of entities, outcomes, and influences, together with the relationships and effects between them.



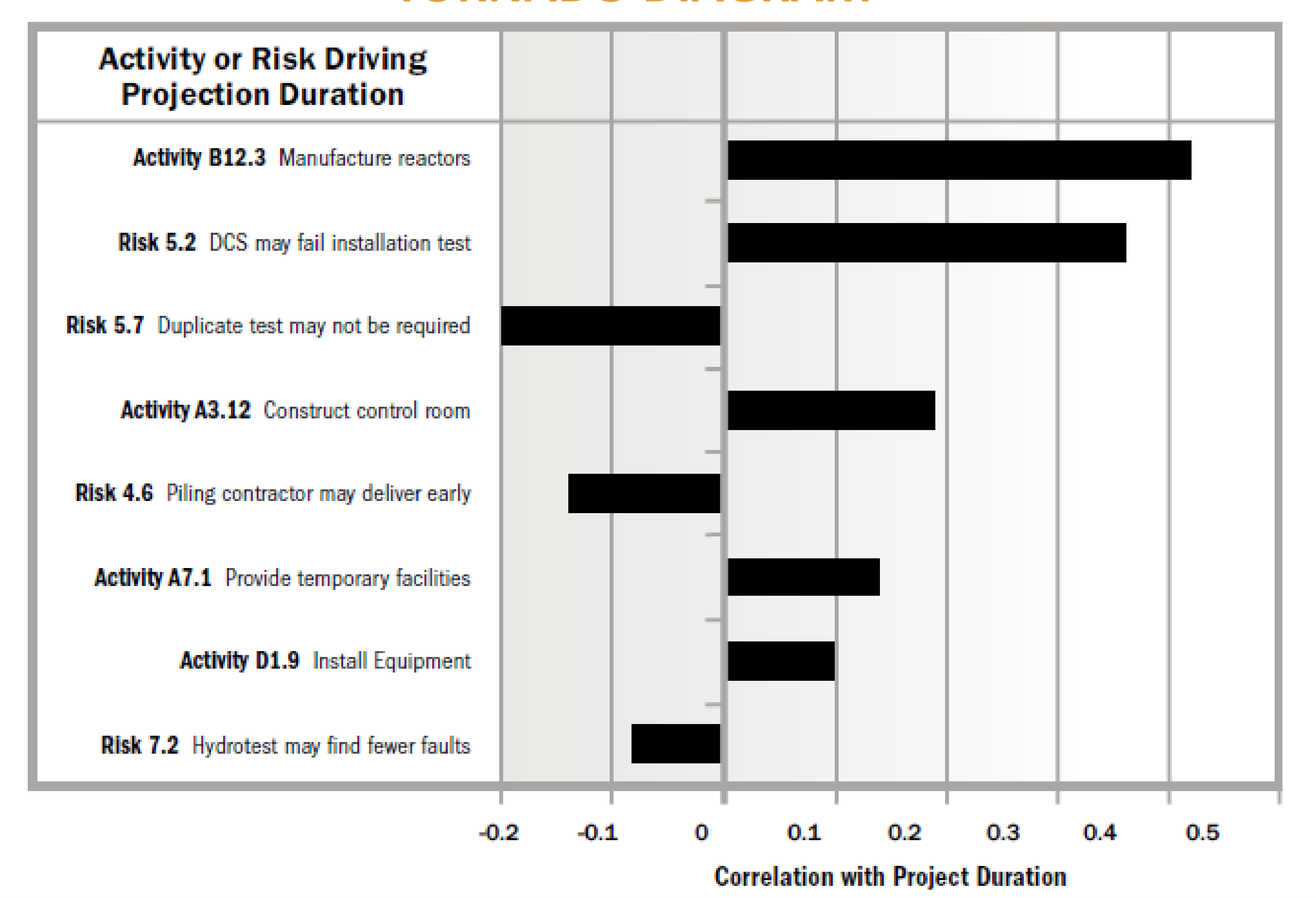


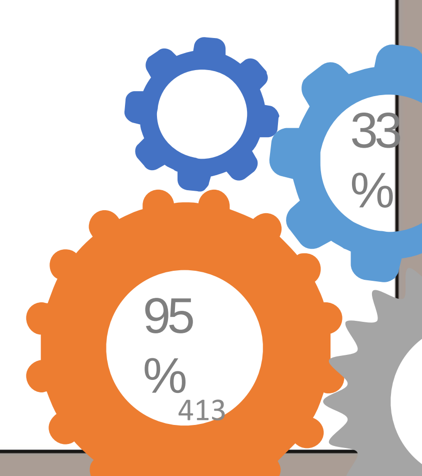
11.4 Perform Quantitative Risk Analysis Tools & Techniques

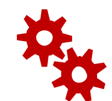


Sensitivity analysis. Helps to determine which individual project risks or other sources of uncertainty have the most potential impact on project outcomes.

TORNADO DIAGRAM







11.4 Perform Quantitative Risk Analysis Tools & Techniques



Decision tree analysis. used to support selection of the best of several alternative courses of action.

A company is trying to determine if prototyping is worth while on the project

Setup Cost= $ 200,000

Prototype

Failure: 35% Probability and $ 120,000 impact

Pass: No Impact

Expected Monetary Value : P * I

Setup Cost = $ 0

Do not prototype

Failure: 70% Probability And $ 450,000 impact

Pass: No Impact

Prototype:

35% * 120,000= 42,000

42,000 +200,000 = 242,000

Do Not Prototype:

70% * 450,000 = 315,000

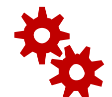
11.4 Perform Quantitative Risk Analysis Output



01 PROJECT DOCUMENTS UPDATES (Risk report)

- Assessment of overall project risk exposure
- Detailed probabilistic analysis of the project.
- Prioritized list of individual project risks.
- Trends in quantitative risk analysis results.
- Recommended risk responses.





11.5 Plan Risk Responses

Legend:
New Item
Already Explained Item

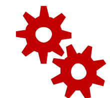


Inputs, Tools & Techniques, and Outputs

Inputs	
Project management plan (Resource management plan)	14
Project management plan (Risk management plan)	12
Project management plan (Cost baseline)	7
Project documents (Lessons learned register)	27
Project documents (Project schedule)	11
Project documents (Project team assignments)	7
Project documents (Resource calendars)	7
Project documents (Risk register)	22
Project documents (Risk report)	10
Project documents (Stakeholder register)	17
Enterprise environmental factors	40
Organizational process assets	47

Tools & Techniques	
Expert judgment	35
Data gathering (Interviews)	8
Interpersonal and team skills (Facilitation)	9
Strategies for threats	1
Strategies for opportunities	1
Contingent response strategies	1
Strategies for overall project risk	1
Data analysis (Alternatives analysis)	13
Data analysis (Cost-benefit analysis)	5
Decision making (Multicriteria decision analysis)	8

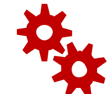
Outputs	
Change requests	24
Project management plan updates (Schedule management plan)	3
Project management plan updates (Cost management plan)	2
Project management plan updates (Quality management plan)	4
Project management plan updates (Resource management plan)	6
Project management plan updates (Procurement management plan)	3
Project management plan updates (Scope baseline)	5
Project management plan updates (Schedule baseline)	9
Project management plan updates (Cost baseline)	12
Project documents updates (Assumption log)	17
Project documents updates (Cost forecasts)	2
Project documents updates (Lessons learned register)	29
Project documents updates (Project schedule)	7
Project documents updates (Project team assignments)	4
Project documents updates (Risk register)	23
Project documents updates (Risk report)	5



11.5 Plan Risk Responses



Data Flow Diagrams



11.5 Plan Risk Responses Input



01 **PROJECT MANAGEMENT PLAN**

- Resource management plan
- Risk management plan
- Cost baseline

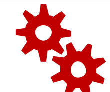
02 **PROJECT DOCUMENTS**

- Lessons learned register
- Project schedule
- Project team assignments
- Resource calendars
- Risk register
- Risk report
- Stakeholder register

03 **ENTERPRISE ENVIRONMENTAL FACTORS**

04 **ORGANIZATIONAL PROCESS ASSETS**





11.5 Plan Risk Responses   Tools & Techniques



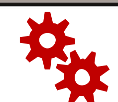
01 **EXPERT JUDGMENT**

02 **DATA GATHERING**

03 **INTERPERSONAL AND TEAM SKILLS**

04 **STRATEGIES FOR THREATS**

1. **Escalate.** appropriate when a threat is **outside** the scope of the project. PM determines who should be notified about the threat and communicates the details to it.
2. **Avoid.** when the project team acts to eliminate the threat or protect the project from its impact. appropriate for high-priority threats with a high probability of occurrence and a large negative impact. Like changing the project plan.
3. **Transfer.** shifting ownership of a threat to a third party to manage the risk. Like insurance
4. **Mitigate.** action is taken to reduce the probability of occurrence and/or impact of a threat. Like dealing with professional supplier.
5. **Accept.** acknowledges the existence of a threat, but no proactive action is taken, appropriate for low-priority threats. Like using the contingency reserved.



11.5 Plan Risk Responses Tools & Techniques

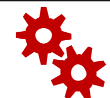


05 STRATEGIES FOR OPPORTUNITIES

1. **Escalate**.
2. **Exploit**. The exploit strategy may be selected for high-priority opportunities where the organization wants to ensure that the opportunity is realized. by ensuring that it definitely happens, increasing the probability of occurrence to 100%. Like using new technology to reduce cost and duration.
3. **Share**. Sharing involves transferring ownership of an opportunity to a third party so that it shares some of the benefit if the opportunity occurs. Like joint-venture between companies.
4. **Enhance**. used to increase the probability and/or impact of an opportunity. Like add more resources to activity to finish it early.
5. **Accept**. Accepting an opportunity acknowledges its existence but no proactive action is taken. This strategy may be appropriate for low-priority opportunities.

06 CONTINGENT RESPONSE STRATEGIES

It is appropriate for the project team to make a response plan that will only be executed under certain predefined conditions.



11.5 Plan Risk Responses

Tools & Techniques



07 STRATEGIES FOR OVERALL PROJECT RISK

1. Escalate
2. Avoid / Exploit
3. Transfer / Share.
4. Mitigate / Enhance.
5. Accept

08 DATA ANALYSIS

- Alternatives analysis
- Cost-benefit analysis.

09 DECISION MAKING

11.5 Plan Risk Responses Output



01 **CHANGE REQUESTS**

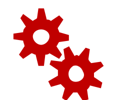
02 **PROJECT MANAGEMENT PLAN UPDATES**

- Schedule management plan
- Cost management plan
- Quality management plan
- Resource management plan
- Procurement management plan
- Scope baseline
- Schedule baseline
- Cost baseline

03 **PROJECT DOCUMENTS UPDATES**

- Assumption log
- Cost forecasts
- Lessons learned register
- Project schedule
- Project team assignments
- Risk register
- Risk report





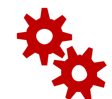
11.6 Implement Risk Responses

Legend:
New Item
Already Explained Item



Inputs, Tools & Techniques, and Outputs

Inputs		Tools & Techniques		Outputs	
Project management plan (Risk management plan)	12	Expert judgment	35	Change requests	24
Project documents (Lessons learned register)	27	Interpersonal and team skills (Influencing)	4	Project documents updates (Issue log)	14
Project documents (Risk register)	22	Project management information system	12	Project documents updates (Lessons learned register)	29
Project documents (Risk report)	10			Project documents updates (Project team assignments)	4
Organizational process assets	47			Project documents updates (Risk register)	23
				Project documents updates (Risk report)	5



11.6 Implement Risk Responses



Data Flow Diagrams

Project Management Plan

Project management plan
- Risk management plan

Project Documents

Project documents
- Lessons learned register
- Risk register
- Risk report

Enterprise/ Organization

- Organizational process assets

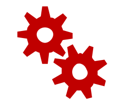
11.6 Implement Risk Responses

- Change requests

4.6 Perform Integrated Change Control

Project documents updates
- Lessons learned register
- Issue log
- Project team assignments
- Risk register
- Risk report

Project Documents



11.6 Implement Risk Responses

Input



01 **PROJECT MANAGEMENT PLAN**

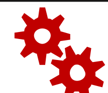
- Risk management plan

02 **PROJECT DOCUMENTS**

- Lessons learned register
- Risk register
- Risk report

03 **ORGANIZATIONAL PROCESS ASSETS**





11.6 Implement Risk Responses   Tools & Techniques

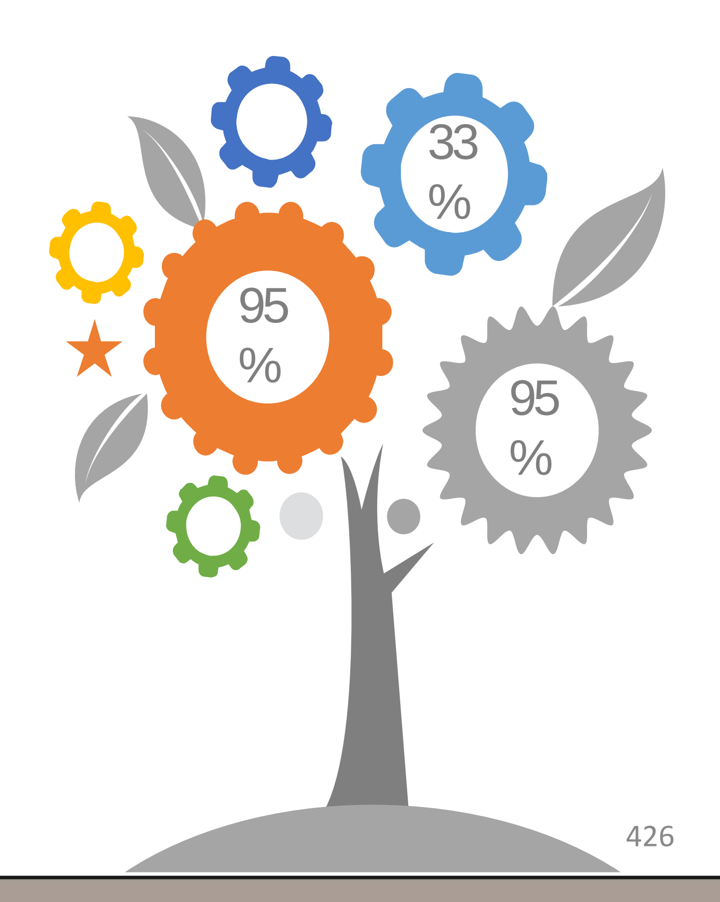


01 **EXPERT JUDGMENT**

02 **INTERPERSONAL AND TEAM SKILLS**

- Influencing

03 **PROJECT MANAGEMENT INFORMATION SYSTEM**



11.6 Implement Risk Responses Output





01 **CHANGE REQUESTS**

02 **PROJECT DOCUMENTS UPDATES**

- Issue log
- Lessons learned register
- Project team assignments
- Risk register
- Risk report



11.7 Monitor Risks

Legend:
New Item
Already Explained Item



Inputs, Tools & Techniques, and Outputs

Inputs		Tools & Techniques		Outputs	
Project management plan (Risk management plan)	12	Data analysis (Technical performance analysis)	1	Work performance information	10
Project documents (Issue log)	12	Data analysis (Reserve analysis)	5	Change requests	24
Project documents (Lessons learned register)	27	Audits	3	Project management plan updates (Any component)	5
Project documents (Risk register)	22	Meetings	28	Project documents updates (Assumption log)	17
Project documents (Risk report)	10			Project documents updates (Issue log)	14
Work performance data	10			Project documents updates (Lessons learned register)	29
Work performance reports	4			Project documents updates (Risk register)	23
				Project documents updates (Risk report)	5
				Organizational process assets updates	10



11.7 Monitor Risks



Data Flow Diagrams

Inputs

Project Management Plan

Project management plan
- Risk management plan

Project Documents

Project documents
- Issue log
- Lessons learned register
- Risk register
- Risk report

4.3 Direct and Manage Project Work
- Work performance data

4.5 Monitor and Control Project Work
- Work performance reports

11.7 Monitor Risks

Outputs

4.5 Monitor and Control Project Work
- Work performance information

4.6 Perform Integrated Change Control
- Change requests

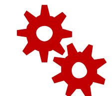
Project Management Plan

Project management plan updates
- Any component

Project Documents

Project documents updates
- Assumption log
- Issue log
- Lessons learned register
- Risk register
- Risk report

Enterprise/ Organization
- Organizational process assets updates



11.7 Monitor Risks Input



01 **PROJECT MANAGEMENT PLAN**

- Risk management plan

02 **PROJECT DOCUMENTS**

- Issue log
- Lessons learned register
- Risk register
- Risk report

03 **WORK PERFORMANCE DATA**

04 **WORK PERFORMANCE REPORTS**





Tools & Techniques



01 **DATA ANALYSIS**

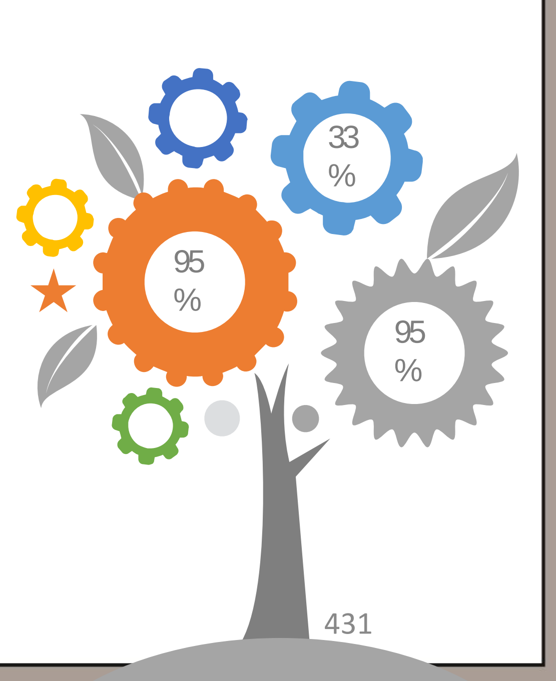
- **Technical performance analysis.** compares technical accomplishments during project execution to the schedule of technical achievement.

- **Reserve analysis.** compares the amount of the contingency reserves remaining to the amount of risk remaining to determine if the remaining reserve is adequate.

02 **AUDITS**

Effectiveness of the risk management process & reasons of risk occurrence

03 **MEETINGS**



11.7 Monitor Risks Output



01 **WORK PERFORMANCE INFORMATION**

Change requests

02 **PROJECT MANAGEMENT PLAN UPDATES**

- Any component

03 **PROJECT DOCUMENTS UPDATES**

- Assumption log
- Issue log
- Lessons learned register
- Risk register
- Risk report

04 **ORGANIZATIONAL PROCESS ASSETS UPDATES**





12. PROJECT PROCUREMENT MANAGEMENT



Presented by :
Abdulfattah Ajlan
Certified PMP Trainer

PROJECT PROCUREMENT MANAGEMENT





Project Procurement Management
Includes the processes necessary to purchase or acquire products, services, or results needed **from outside the project team.**

Project Procurement . Includes the management and control processes required to develop and administer agreements such as contracts, purchase orders, memoranda of agreements (MOAs), or internal service level agreements (SLAs).

Buyer **Seller**



Knowledge Areas	Project Management Process Groups				
	Initiating	Planning	Executing	Monitoring and Controlling	Closing
Project Integration Management	4.1 Develop Project Charter	4.2 Develop Project Management Plan	4.3 Direct and Manage Project Work 4.4 Manage Project Knowledge	4.5 Monitor and Control Project Work 4.6 Perform Integrated Change Control	4.7 Close Project
Project Scope Management		5.1 Plan Scope Management 5.2 Collect Requirements 5.3 Define Scope 5.4 Create WBS		5.5 Validate Scope 5.6 Control Scope	
Project Schedule Management		6.1 Plan Schedule 6.2 Define Activities 6.3 Sequence Activities 6.4 Estimate Activity Durations 6.5 Develop Schedule Management		6.6 Control Schedule	
Project Cost Management		7.1 Plan Cost Management 7.2 Estimate Costs 7.3 Determine Budge		7.4 Control Costs	
Project Quality Management		8.1 Plan Quality Management	8.2 Manage Quality	8.3 Control Quality	
Project Resource Management		9.1 Plan Resource Management 9.2 Estimate Activity Resources	9.3 Acquire Resources 9.4 Develop Team 9.5 Manage Team	9.6 Control Resources	
Project Communications Management		10.1 Plan Communications Management	10.2 Manage Communications	10.3 Monitor Communications	
Project Risk Management		11.1 Plan Risk Management 11.2 Identify Risks 11.3 Perform Qualitative Risk Analysis 11.4 Perform Quantitative Risk Analysis 11.5 Plan Risk Responses	11.6 Implement Risk Responses	11.7 Monitor Risks	
Project Procurement Management		12.1 Plan Procurement Management	12.2 Conduct Procurements	12.3 Control Procurements	
Project Stakeholder Management	13.1 Identify Stakeholders	13.2 Plan Stakeholder Engagement	13.3 Manage Stakeholder Engagement	13.4 Monitor Stakeholder Engagement	



Logistics and supply chain management.

- **Long-lead items** may be procured in advance of other procurement contracts to meet the planned project completion date.
- It is possible to begin contracting for these **long-lead materials, supplies, or equipment** before the final design of the end product itself is completed based on **the known requirements** identified in the top-level design.

Technology and stakeholder relations.

- Use of technology including webcams to improve **stakeholder communications** and relations.
- The **progress** on the project can be viewed on the Internet by all stakeholders.
- Video data can also be stored, allowing analysis if a claim arises.

Trial engagements.

- Some projects will engage several **candidate sellers** for initial deliverables and work products on a paid basis before making the full commitment to a larger portion of the project scope.
- This **accelerates momentum** by allowing the buyer to **evaluate** potential partners, while simultaneously making progress on project work.

Contracts Type



Firm Fixed Price Contracts (requirements are well defined)

Firm Fixed Price (FFP)

Fixed Price Incentive Fee (FPIF)

Fixed Price Economic Price Adjustment (FPEPA)

Cost Reimbursable Contracts (CR) (scope is expected to change significantly during the execution)

Cost Plus Fixed Fee (CPFF)

Cost Plus Incentive Fee Contracts (CPIF)

Cost Plus Award Fee Contracts (CAF)

Time and Material Contracts (T&M): (used for external staff hiring, acquisition of experts)

Marge of above two contracts types



Buyer Seller



Firm Fixed Price

Firm Fixed Price (FFP)

Fixed Price Incentive Fee (FPIF)

Time and Material Contracts

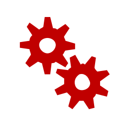
(T&M)

Cost Reimbursable

Cost Plus Incentive Fee (CPIF)

Cost Plus Fixed Fee (CPFF)





12.1 Plan Procurement Management

Legend:
New Item
Already Explained Item



Inputs, Tools & Techniques, and Outputs

Inputs	
Project charter	14
Business documents (Business case)	6
Business documents (Benefits management plan)	5
Project management plan (Scope management plan)	8
Project management plan (Quality management plan)	7
Project management plan (Resource management plan)	14
Project management plan (Scope baseline)	16
Project documents (Milestone list)	9
Project documents (Project team assignments)	7
Project documents (Requirements documentation)	13
Project documents (Requirements traceability matrix)	7
Project documents (Resource requirements)	8
Project documents (Risk register)	22
Project documents (Stakeholder register)	17
Enterprise environmental factors	40
Organizational process assets	47

Tools & Techniques	
Expert judgment	35
Data gathering (Market research)	1
Data analysis (Make-or-buy analysis)	1
Source selection analysis	1
Meetings	28

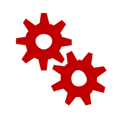
Outputs	
Procurement management plan	1
Procurement strategy	1
Bid documents	1
Procurement statement of work	1
Source selection criteria	1
Make-or-buy decisions	1
Independent cost estimates	1
Change requests	24
Project documents updates (Lessons learned register)	29
Project documents updates (Milestone list)	2
Project documents updates (Requirements documentation)	7
Project documents updates (Requirements traceability matrix)	7
Project documents updates (Risk register)	23
Project documents updates (Stakeholder register)	12
Organizational process assets updates	10



12.1 Plan Procurement Management



Data Flow Diagrams

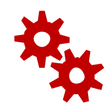


12.1 Plan Procurement Management



Typical procurement steps might be:

1. Prepare the procurement statement of work (SOW) or terms of reference (TOR).
2. Prepare a high-level cost estimate to determine the budget.
3. Advertise.
4. Identify a short list of qualified sellers.
5. Prepare and issue bid documents.
6. Prepare and submit proposals by the seller.
7. Conduct a technical evaluation of the proposals including quality.
8. Perform a cost evaluation of the proposals.
9. Prepare the final combined quality and cost evaluation to select the winning proposal.
10. Finalize negotiations and sign contract between the buyer and the seller.



12.1 Plan Procurement Management Input



01 **PROJECT CHARTER**

02 **BUSINESS DOCUMENTS**

- Business case
- Benefits management plan

03 **PROJECT MANAGEMENT PLAN**

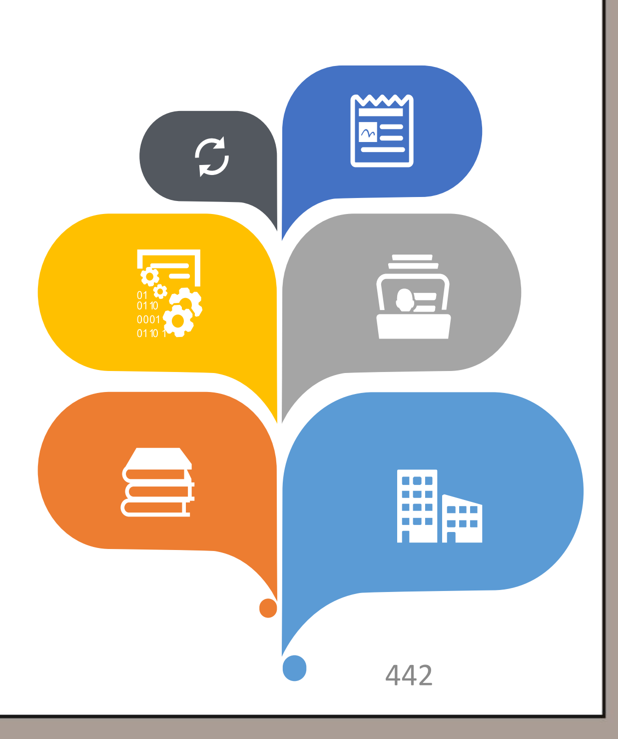
- Scope management plan
- Quality management plan
- Resource management plan
- Scope baseline.

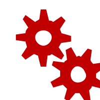
04 **PROJECT MANAGEMENT PLAN.**

- Milestone list.
- Project team assignments.
- Requirements documentation.
- Requirements traceability matrix.
- Resource requirements.
- Risk register.
- Stakeholder register.

05 **ENTERPRISE ENVIRONMENTAL FACTORS**

06 **ORGANIZATIONAL PROCESS ASSETS**





6.1 Plan Procurement Management Tools & Techniques



01 **EXPERT JUDGMENT**

02 **DATA GATHERING**

- **Market research:**
  includes examination of industry and specific seller capabilities.

03 **DATA ANALYSIS**

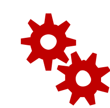
- **Make-or-buy analysis**

04 **SOURCE SELECTION ANALYSIS**

- **Least cost.**
- **Qualifications only.**
- **Quality-based/ highest technical proposal score.**
- **Quality and cost-based.**
- **Single source.**
- **Fixed budget.**



05 **Meeting**



12.1 Plan Procurement Management   Output



IPMC





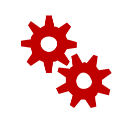
The objective of the procurement strategy is to determine:

1. **Delivery methods:** with Subcontracting, joint venture, turnkey, design build (DB), design bid build (DBB), design build operate (DBO), build own operate transfer (BOOT)
2. **Contract payment types:** Fixed price – Cost plus - Incentives and awards.
3. **Procurement phases:** describe the phases and phase gate.

03 BID DOCUMENTS

Biding document can include:

- **Request for information (RFI):** is used when more information on the goods and services to be acquired, needed from the sellers.
- **Request for quotation (RFQ)** : used when more information is needed on *how vendors would satisfy the requirements and/or how much it will cost*.
- **Request for proposal (RFP).** is used when *there is a problem in the project and the solution is not easy to determine*.



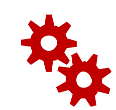
12.1 Plan Procurement Management Output



04 PROCUREMENT STATEMENT OF WORK (SOW)

- **The SOW** describes the procurement item in sufficient detail (specifications, quantity desired, quality levels, performance data, period of performance, work location, and other requirements).
- The procurement SOW should be **clear**, **complete**, and **concise**.
- **Terms of reference (TOR)** is sometimes used when contracting for services.
- **SOW or TOR** typically includes these elements:
  - **Tasks** the contractor is required to perform as well as specified coordination requirements;
  - **Standards** the contractor will fulfill that are applicable to the project;
  - **Data** that needs to be submitted for approval;
  - **Detailed list** of all data and services that will be provided to the contractor by the buyer
  - **Definition** of the schedule for initial submission and the review/approval time required.

05 SOURCE SELECTION CRITERIA



12.1 Plan Procurement Management

Output



06 **MAKE-OR-BUY DECISIONS**

07 **INDEPENDENT COST ESTIMATES**

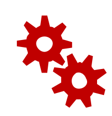
Developed either internally or by using external resources and provide a reasonableness check against the proposals submitted by bidders.

08 **CHANGE REQUESTS**

09 **PROJECT DOCUMENTS UPDATES.**

- Lessons learned register.
- Milestone list.
- Requirements documentation.
- Requirements traceability matrix.
- Risk register.
- Stakeholder register.

10 **ORGANIZATIONAL PROCESS ASSETS UPDATES**



12.2 Conduct Procurement Management

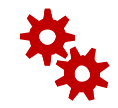


Legend:
New Item
Already Explained Item



Inputs, Tools & Techniques, and Outputs

Inputs		Tools & Techniques		Outputs	
PMP (Scope management plan)	8	Expert judgment	35	Selected sellers	1
PMP (Requirements management plan)	7	Advertising	1	Agreements	1
PMP (Communications management plan)	7	Bidder conferences	1	Change requests	24
PMP (Risk management plan)	12	Data analysis (Proposal evaluation)	1	PMP updates (Requirements management plan)	2
PMP (Procurement management plan)	3	Interpersonal and team skills (Negotiation)	5	PMP updates (Quality management plan)	4
PMP (Configuration management plan)	3			PMP updates (Communications management plan)	6
PMP (Cost baseline)	7			PMP updates (Risk management plan)	4
Project documents (Lessons learned register)	27			PMP updates (Procurement management plan)	3
Project documents (Project schedule)	11			PMP updates (Scope baseline)	5
Project documents (Requirements documentation)	13			PMP updates (Schedule baseline)	9
Project documents (Risk register)	22			PMP updates (Cost baseline)	12
Project documents (Stakeholder register)	17			Project documents updates (Lessons learned register)	29
Procurement documentation	4			Project documents updates (Requirements documentation)	7
Seller proposals	1			Project documents updates (Requirements traceability matrix)	7
Enterprise environmental factors	40			Project documents updates (Resource calendars)	3
Organizational process assets	47			Project documents updates (Risk register)	23
				Project documents updates (Stakeholder register)	12
				Organizational process assets updates	10



12.2 Conduct Procurement Management



Data Flow Diagrams

Project Management Plan

Project management plan
- Scope management plan
- Requirements management plan
- Communications management plan
- Risk management plan
- Procurement management plan
- Configuration management plan
- Cost baseline

Project Documents

Project documents
- Lessons learned register
- Project schedule
- Requirements documentation
- Risk register
- Stakeholder register

Procurement Documentation

Enterprise/ Organization
- Enterprise environmental factors
- Organizational process assets

Sellers
- Seller proposals

12.2 Conduct Procurements

- Agreements

12.3 Control Procurements
- Selected sellers

4.6 Perform Integrated Change Control
- Change requests

Project Management Plan

Project management plan updates
- Requirements management plan
- Quality management plan
- Communications management plan
- Risk management plan
- Procurement management plan
- Scope baseline
- Schedule baseline
- Cost baseline

Project Documents

Project documents updates
- Lessons learned register
- Requirements documentation
- Requirements traceability matrix
- Resource calendars
- Risk register
- Stakeholder register

Enterprise/ Organization
- Organizational process assets updates

4.1 Develop Project Charter

4.5 Monitor and Control Project Work

4.7 Close Project or Phase

6.5 Develop Schedule

7.3 Determine Budget

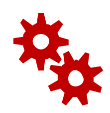
9.6 Control Resources

11.2 Identify Risks

12.3 Control Procurements

13.1 Identify Stakeholders

13.2 Plan Stakeholder Engagement



12.2 Conduct Procurement Management Input



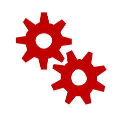
01 **PROJECT MANAGEMENT PLAN**

- Scope management plan
- Requirements management plan
- Communications management plan
- Risk management plan
- Procurement management plan
- Configuration management plan
- Cost baseline

02 **PROJECT DOCUMENTS**

- Lessons learned register.
- Project schedule.
- Requirements documentation.
- Risk register.
- Stakeholder register.





12.2 Conduct Procurement Management Input



03 **PROCUREMENT DOCUMENTATION**

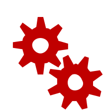
- Bid documents.
- Procurement statement of work.
- Independent cost estimates.
- Source selection criteria.

04 **SELLER PROPOSALS**

- If the seller is going to submit a price proposal, good practice is to require that it be separate from the technical proposal.
- The evaluation body reviews each submitted proposal according to the source selection criteria and selects the seller that can best satisfy the buying organization's requirements.

05 **EEF**

06 **OPA**



12.2 Conduct Procurement Management Tools & Techniques



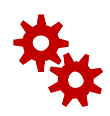
01 **EXPERT JUDGMENT**

02 **ADVERTISING**

- Advertising is communicating with potential users of a product, service, or result.
- Existing lists of potential sellers often can be expanded by placing advertisements in general circulation publications such as selected newspapers or in specialty trade publications.
- Most government jurisdictions require public advertising or online posting of pending government contracts.

03 **BIDDER CONFERENCES**

- (also called **contractor** conferences, **vendor** conferences, and **pre-bid conferences**) are meetings between the buyer and prospective sellers prior to proposal submittal.
- They are used to ensure that all prospective bidders have a clear and common understanding of the procurement and no bidders receive **preferential treatment**.



12.2 Conduct Procurement Management Tools & Techniques

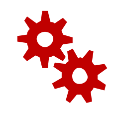


04 DATA ANALYSIS

- Proposal evaluation. to ensure they are complete and respond in full to the bid documents, procurement statement of work, source selection criteria, and any other documents that went out in the bid package.

05 INTERPERSONAL AND TEAM SKILLS

- Negotiation



12.2 Conduct Procurement Management Outputs



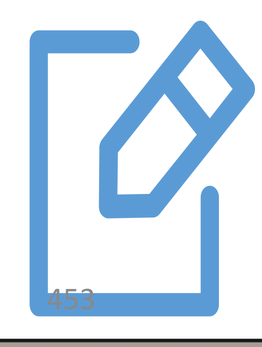
01 SELECTED SELLERS

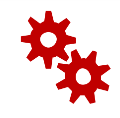
- The selected sellers are those who have been judged to be in a competitive range based on the outcome of the proposal or bid evaluation.
- Final approval of complex, high-value, high-risk procurements will generally require organizational senior management approval prior to award.

02 AGREEMENTS

Agreements are used to define initial intentions for a project. Agreements may take the form of contracts, memorandums of understanding (MOUs), service level agreements (SLA), letters of agreement, letters of intent, verbal agreements, email, or other written agreements.

03 CHANGE REQUESTS.







A Contract

A contract is a <u>**mutually binding agreement**</u> that

- <u>**obligates the seller**</u> to provide the specified products, services, or results;
- <u>**obligates the buyer**</u> to compensate the seller;

And represents a legal relationship that is subject to remedy in the courts.





12.2 Conduct Procurement Management Outputs



04 PROJECT MANAGEMENT PLAN UPDATES

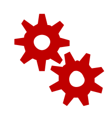
- Requirements management plan.
- Quality management plan.
- Communications management plan.
- Risk management plan.
- Procurement management plan.
- Scope baseline.
- Schedule baseline.
- Cost baseline.

05 PROJECT DOCUMENTS UPDATES

- Lessons learned register.
- Requirements documentation.
- Requirements traceability matrix.
- Resource calendars.
- Risk register.
- Stakeholder register.



ORGANIZATIONAL PROCESS ASSETS UPDATES



12.3 Control Procurement Management

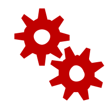
Legend:


Already Explained Item



Inputs, Tools & Techniques, and Outputs

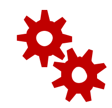
Inputs		Tools & Techniques		Outputs	
PMP (Requirements management plan)	7	Expert judgment	35	Closed procurements	1
PMP (Risk management plan)	12	Claims administration	1	Work performance information	10
PMP (Procurement management plan)	3	Data analysis (Performance reviews)	4	Procurement documentation updates	1
PMP (Change management plan)	4	Data analysis (Earned value analysis)	4	Change requests	24
PMP (Schedule baseline)	5	Data analysis (Trend analysis)	7	PMP updates (Risk management plan)	4
Project documents (Assumption log)	14	Inspection	3	PMP updates (Procurement management plan)	3
Project documents (Lessons learned register)	27	Audits	3	PMP updates (Schedule baseline)	9
Project documents (Milestone list)	9			PMP updates (Cost baseline)	12
Project documents (Quality reports)	5			Project documents updates (Lessons learned register)	29
Project documents (Requirements documentation)	13			Project documents updates (Resource requirements)	3
Project documents (Requirements traceability matrix)	7			Project documents updates (Requirements traceability matrix)	7
Project documents (Risk register)	22			Project documents updates (Risk register)	23
Project documents (Stakeholder register)	17			Project documents updates (Stakeholder register)	12
Agreements	11			Organizational process assets updates	10
Procurement documentation	4				
Approved change requests	3				
Work performance data	10				
Enterprise environmental factors	40				
Organizational process assets	47				



12.3 Control Procurement Management



Data Flow Diagrams



12.3 Control Procurement Management Input



01 PROJECT MANAGEMENT PLAN

- Requirements management plan.
- Risk management plan.
- Procurement management plan.
- Change management plan.
- Schedule baseline.

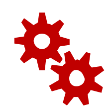
02 PROJECT DOCUMENTS

- Assumption log.
- Lessons learned register.
- Milestone list.
- Quality reports.
- Requirements documentation.
- Requirements traceability matrix.
- Risk register.
- Stakeholder register.





03 AGREEMENTS



12.3 Control Procurement Management Input



04 PROCUREMENT DOCUMENTATION

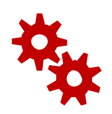
05 APPROVED CHANGE REQUESTS

06 WORK PERFORMANCE DATA

07 ENTERPRISE ENVIRONMENTAL FACTORS

08 ORGANIZATIONAL PROCESS ASSETS





12.3 Control Procurement Management   Tools & Techniques



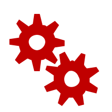
01 **EXPERT JUDGMENT**

02 **CLAIMS ADMINISTRATION**

- The **contested changes are called claims.** When they cannot be resolved, they become **disputes** and finally **appeals**.
- Claims are documented, processed, monitored, and managed throughout the contract life cycle, usually in accordance with the terms of the contract.
- If the parties themselves do not resolve a claim, it may have to be handled in accordance with alternative dispute resolution (ADR) typically following procedures established in the contract.
- Settlement of all claims and disputes through **negotiation** is the preferred method.

03 **DATA ANALYSIS**

- **Performance Reviews.** Measure, compare, and analyze quality, resource, schedule, and cost performance against the agreement.
- **Earned Value Analysis (EVA).**
- **Trend Analysis.** Trend analysis can develop a forecast estimate at completion (EAC)



12.3 Control Procurement Management Tools & Techniques



04 **INSPECTION**

a structured review of the **work being performed** by the contractor.

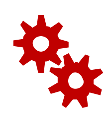
Like review the contractor ongoing work at site.

AUDIT	INSPECTION
• Less Frequent • More formalized • Larger scale/scope • Often system or program based • Structured but allows for further investigation & why analysis	• Frequent, repeating • Large # of inspectors, inspections / year • Focused / specific • Often equipment or area based • More rigid, often checklist-based
Allows for deeper investigation & cause analysis to identify systematic / process issues	Allows for the identification & correction of hazards on a case-by-case basis

05 **AUDITS**

- A structured review of the **procurement process**.
- Rights and obligations related to audits should be described in the procurement contract.
- Resulting audit observations should be brought to the attention of the buyer's project manager and the seller's project manager for adjustments to the project, when necessary.

Like checking the manufacturing of material before delivery to site.



12.3 Control Procurement Management Output

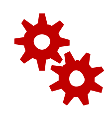


01 CLOSED PROCUREMENTS

- **The buyer**, usually through its authorized procurement administrator, provides **the seller** with **formal written notice that the contract has been completed**.
- Requirements for formal procurement closure are usually defined in the terms and conditions of the contract and are included in the procurement management plan.
- Typically, all deliverables should have been provided on time and meet technical and quality requirements, there should be no outstanding claims or invoices, and all final payments should have been made.
- The project management team should have approved all deliverables prior to closure.

02 WORK PERFORMANCE INFORMATION

How a seller is performing by comparing the deliverables received, the technical performance achieved, and the costs incurred and accepted against the SOW budget for the work performed.



12.3 Control Procurement Management Output



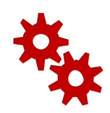
03 PROCUREMENT DOCUMENTATION UPDATES

- Includes the contract with all supporting schedules, requested unapproved contract changes, and approved change requests.
- Procurement documentation also includes any seller-developed technical documentation and other work performance information such as deliverables, seller performance reports and warranties, financial documents including invoices and payment records, and the results of contract-related inspections.

04 PROJECT MANAGEMENT PLAN UPDATES

- Risk management plan.
- Procurement management plan.
- Cost baseline.
- Schedule baseline.





12.3 Control Procurement Management Output



05 **PROJECT DOCUMENTS UPDATES**

- Lessons learned register.
- Resource requirements.
- Requirements traceability matrix.
- Risk register.
- Stakeholder register.

06 **ORGANIZATIONAL PROCESS ASSETS UPDATES**

- Payment schedules and requests.
- Seller performance evaluation documentation
- Prequalified seller lists updates.
- Lessons learned repository.
- Procurement file.





13. PROJECT STAKEHOLDER MANAGEMENT



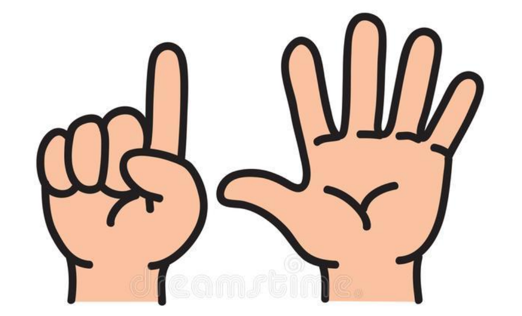
Presented by :

Abdulfattah Ajlan

Certified PMP Trainer



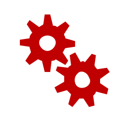






Project Stakeholder Management includes the processes required to identify the people, groups, or organizations that could impact or be impacted by the project, to analyze stakeholder expectations and their impact on the project, and to develop appropriate management strategies for effectively engaging stakeholders in project decisions and execution.

Knowledge Areas	Project Management Process Groups				
	Initiating	Planning	Executing	Monitoring and Controlling	Closing
Project Integration Management	4.1 Develop Project Charter	4.2 Develop Project Management Plan	4.3 Direct and Manage Project Work 4.4 Manage Project Knowledge	4.5 Monitor and Control Project Work 4.6 Perform Integrated Change Control	4.7 Close Project
Project Scope Management		5.1 Plan Scope Management 5.2 Collect Requirements 5.3 Define Scope 5.4 Create WBS		5.5 Validate Scope 5.6 Control Scope	
Project Schedule Management		6.1 Plan Schedule 6.2 Define Activities 6.3 Sequence Activities 6.4 Estimate Activity Durations 6.5 Develop Schedule Management		6.6 Control Schedule	
Project Cost Management		7.1 Plan Cost Management 7.2 Estimate Costs 7.3 Determine Budge		7.4 Control Costs	
Project Quality Management		8.1 Plan Quality Management	8.2 Manage Quality	8.3 Control Quality	
Project Resource Management		9.1 Plan Resource Management 9.2 Estimate Activity Resources	9.3 Acquire Resources 9.4 Develop Team 9.5 Manage Team	9.6 Control Resources	
Project Communications Management		10.1 Plan Communications Management	10.2 Manage Communications	10.3 Monitor Communications	
Project Risk Management		11.1 Plan Risk Management 11.2 Identify Risks 11.3 Perform Qualitative Risk Analysis 11.4 Perform Quantitative Risk Analysis 11.5 Plan Risk Responses	11.6 Implement Risk Responses	11.7 Monitor Risks	
Project Procurement Management		12.1 Plan Procurement Management	12.2 Conduct Procurements	12.3 Control Procurements	
Project Stakeholder Management	13.1 Identify Stakeholders	13.2 Plan Stakeholder Engagement	13.3 Manage Stakeholder Engagement	13.4 Monitor Stakeholder Engagement	



13.1 Identify Stakeholders

Legend:
New Item
Already Explained Item

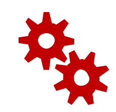


Inputs, Tools & Techniques, and Outputs

Inputs	
Project charter	14
Business documents (Business case)	6
Business documents (Benefits management plan)	5
Project management plan (Communications management plan)	7
Project management plan (Stakeholder engagement plan)	8
Project documents (Change log)	6
Project documents (Issue log)	12
Project documents (Requirements documentation)	13
Agreements	11
Enterprise environmental factors	40
Organizational process assets	47

Tools & Techniques	
Expert judgment	35
Data gathering (Questionnaires and surveys)	3
Data gathering (Brainstorming)	6
Data analysis (Stakeholder analysis)	3
Data analysis (Document analysis)	5
Data representation (Stakeholder mapping/representation)	1
Meetings	28

Outputs	
Stakeholder register	1
Change requests	24
Project management plan updates (Requirements management plan)	2
Project management plan updates (Communications management plan)	6
Project management plan updates (Risk management plan)	4
Project management plan updates (Stakeholder engagement plan)	6
Project documents updates (Assumption log)	17
Project documents updates (Issue log)	14
Project documents updates (Risk register)	23



13.1 Identify Stakeholders



Data Flow Diagrams

4.1
Develop
Project Charter

- Project charter

Project Management Plan

Project management plan
- Communications management plan
- Stakeholder engagement plan

Project Documents

Project documents
- Change log
- Issue log
- Requirements documentation

Business Documents

- Business case
- Benefits management plan

12.2
Conduct
Procurements

- Agreements

Enterprise/
Organization

- Enterprise environmental factors
- Organizational process assets

13.1
Identify
Stakeholders

Project Management Plan

Project management plan updates
- Requirements management plan
- Communications management plan
- Risk management plan
- Stakeholder engagement plan

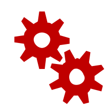
- Stakeholder register

Project Documents

Project documents updates
- Assumption log
- Issue log
- Risk register

4.6
Perform
Integrated
Change Control

- Change requests



13.1 Identify Stakeholders Input



01 **PROJECT CHARTER**

02 **BUSINESS DOCUMENTS**
- **Business case.**
- **Benefits management plan.**

03 **PROJECT MANAGEMENT PLAN**
- **Communications management plan.**
- **Stakeholder engagement plan.**

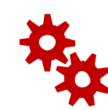
04 **PROJECT DOCUMENTS**
- **Change log**
- **Issue log**
- **Requirements documentation**

05 **AGREEMENTS**

06 **ENTERPRISE ENVIRONMENTAL FACTORS**

07 **ORGANIZATIONAL PROCESS ASSETS**





13.1 Identify Stakeholders   Tools & Techniques



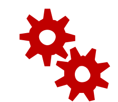
01 **Expert judgment.**

02 **DATA GATHERING.**

- **Questionnaires and surveys**. Can include one-on-one, reviews, focus group sessions, or other mass information collection techniques.

- **Brainstorming**. used to identify stakeholders can include both brainstorming and brain writing.
  - **Brainstorming**. A general data-gathering and creativity technique that elicits input from groups such as team members or subject matter experts.
  - **Brain writing**. A refinement of brainstorming that allows individual participants time to consider the question(s) individually before the group creativity session is held. The information can be gathered in face-to-face groups or using virtual environments supported by technology.





13.1 Identify Stakeholders Tools & Techniques



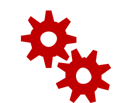
03 **DATA ANALYSIS**

✓ **Stakeholder analysis.**

It results in a list of stakeholders and relevant information such as their positions in the organization, roles on the project, "stakes," expectations, attitudes (their levels of support for the project), and their interest in information about the project.

- Interest.
- Rights
- Ownership.
- Knowledge.
- Contribution.

✓ **Document analysis.** Assessing the available project documentation and lessons learned from previous projects to identify stakeholders and other supporting information.



13.1 Identify Stakeholders Tools & Techniques

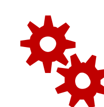


04 DATA REPRESENTATION

❖ **Stakeholder mapping/ representation.**

A method of categorizing stakeholders using various methods.to assists the team in building relationships with the identified project stakeholders. Include:

1. **Power/interest grid, power/influence grid, or impact/influence grid.**
   - Group stakeholders according to their:
     - ✓ level of authority (power)
     - ✓ level of concern about the project's outcomes (interest)
     - ✓ ability to influence the outcomes of the project (influence)
     - ✓ ability to cause changes to the project's planning or execution (impact).
2. **Stakeholder cube.**
   - This is a refinement of the grid models previously mentioned using 3 variables .
3. **Salience model.**
   - Describes classes of stakeholders based on assessments of their power ,influence, urgency
   - The salience model is useful for large complex communities of stakeholders or where there are complex networks of relationships within the community.



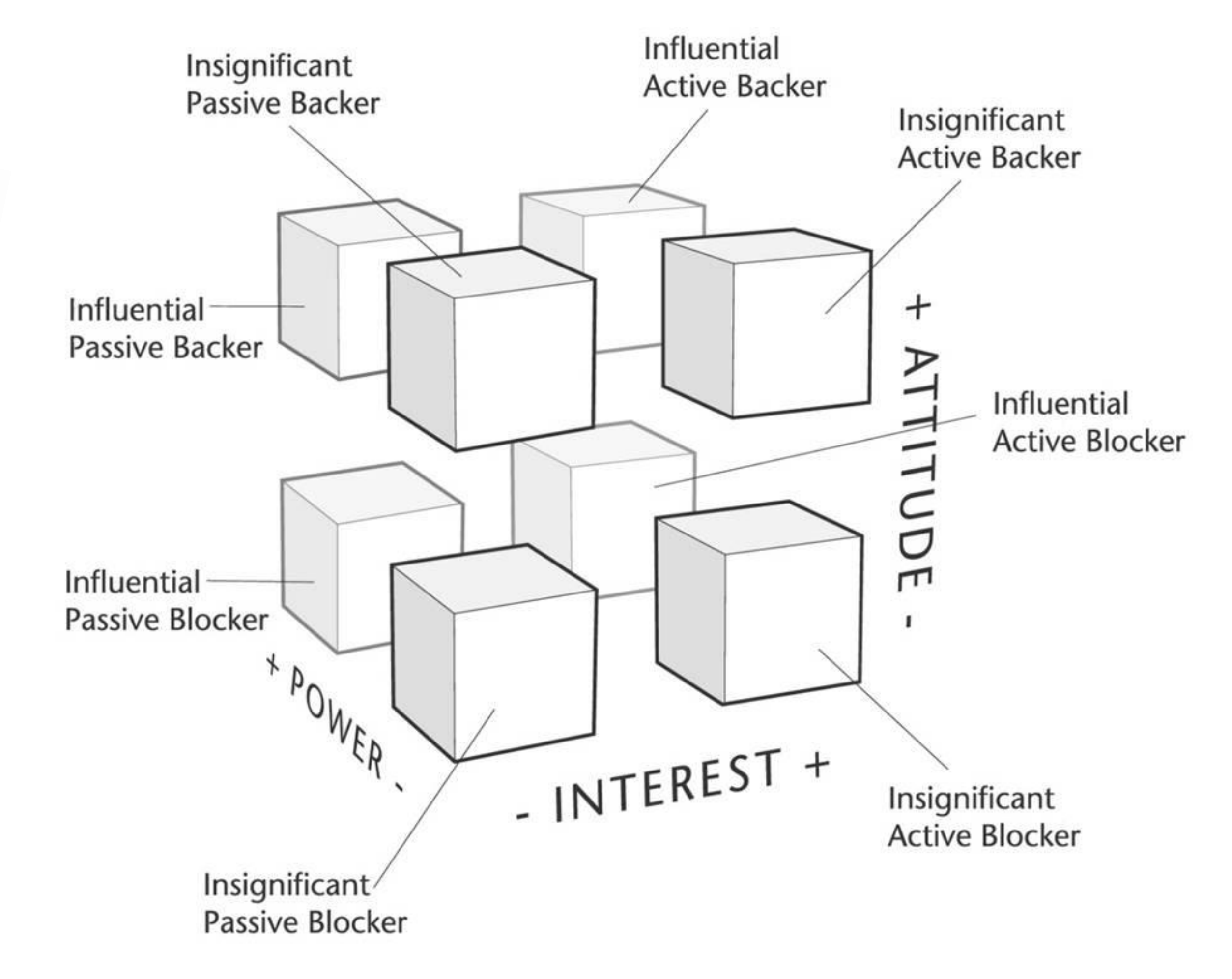
13.1 Identify Stakeholders Tools & Techniques

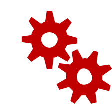


Power/interest grid



Stakeholder cube



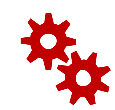


13.1 Identify Stakeholders Tools & Techniques



Salience model

Stakeholder	Criticality to Success	Current Orientation	Degree of Influence
CEO	Medium	Supportive	Large
Business Unit A	High	Resistant	Large
Business Unit B	Medium	Neutral	Medium
Marketing	Medium	Neutral	Small
Finance	High	Supportive	Medium
Legal	Medium	Resistant	Large
HR	Low	Resistant	Small
Automotive Customers	High	Neutral	Medium
Sheet Metal Suppliers	Low	Resistant	Small
Tax Authorities	Medium	Neutral	Medium



13.1 Identify Stakeholders   Tools & Techniques



4. Directions of influence.

Classifies stakeholders according to their influence on the work of the project or the project team itself. As the following :

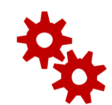
- **Upward**: senior management of the performing organization or customer organization, sponsor, and steering committee.
- **Downward**: the team or specialists contributing knowledge or skills in a temporary capacity,
- **Outward**: stakeholder groups and their representatives outside the project team, such as suppliers, government departments, the public, end-users, and regulators.
- **Sideward**: the peers of the project manager, such as other project managers or middle managers who are in competition for scarce project resources or who collaborate with the project manager in sharing resources or information.

5. Prioritization.

Necessary for projects with a large number of stakeholders, where the membership of the stakeholder community is changing frequently, or when the relationships between stakeholders and the project team or within the stakeholder community are complex.



MEETINGS



13.1 Identify Stakeholders Output



01 STAKEHOLDER REGISTER

This document contains information about identified stakeholders

- **Identification information**. Name, organizational position, location and contact details, and role on the project.
- **Assessment information**. Major requirements, expectations, potential for influencing project outcomes, and the phase of the project life cycle where the stakeholder has the most influence or impact.
- **Stakeholder classification**. Internal/external, impact/influence/power/interest, upward/downward/outward/ sideward, or any other classification model chosen by the project manager.

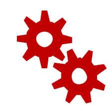
02 CHANGE REQUESTS

Stakeholder Register

Techno-PM
Project Management Templates

Project Manager	Anthony Daukes	Project Phase	Initiation

Role	Contact	Category	Interest	Influence	Expectations	Comms requirements
Sponsor	Phone: +61 4834467651 Email: john.matthew@gmail.com	Internal	●●●	●●●	User friendly and responsive UI across handheld device, tablet or desktop	Video Conference and Emai
Project Lead	Phone: +61 4785739580 Email: luke.wilson@gmail.com	Internal	●●●	○●●	Project to be delivered on time within budget	Email and Telephone
Product Manager	Phone: +91 9923535534 Email: deepak.patel@gmail.com	Internal	○●●	○○●	Clear Requirements and timely completion of	
	Phone: +65 8542533152					



13.1 Identify Stakeholders Output



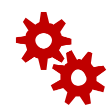
03 PROJECT MANAGEMENT PLAN UPDATES

- ✓ Requirements management plan.
- ✓ Communications management plan.
- ✓ Risk management plan.
- ✓ Stakeholder engagement plan.

04 PROJECT DOCUMENTS UPDATES

- ✓ Assumption log.
- ✓ Issue log.
- ✓ Risk register.





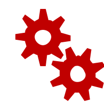
13.2 Plan Stakeholder Engagement

Legend:
New Item
Already Explained Item



Inputs, Tools & Techniques, and Outputs

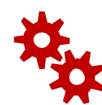
Inputs		Tools & Techniques		Outputs	
Project charter	14	Expert judgment	35	Stakeholder engagement plan	1
Project management plan (Resource management plan)	14	Data gathering (Benchmarking)	3		
Project management plan (Communications management plan)	7	Data analysis (Assumption and constraint analysis)	2		
Project management plan (Risk management plan)	12	Data analysis (Root cause analysis)	6		
Project documents (Assumption log)	14	Decision making (Prioritization/ranking)	1		
Project documents (Change log)	6	Data representation (Mind mapping)	3		
Project documents (Issue log)	12	Data representation (Stakeholder engagement assessment matrix)	4		
Project documents (Project schedule)	11	Meetings	28		
Project documents (Risk register)	22				
Project documents (Stakeholder register)	17				
Agreements	11				
Enterprise environmental factors	40				
Organizational process assets	47				



13.2 Plan Stakeholder Engagement



Data Flow Diagrams



13.2 Plan Stakeholder Engagement Input



01 **PROJECT CHARTER**

02 **PROJECT MANAGEMENT PLAN**

- Resource management plan
- Communications management plan
- Risk management plan

03 **PROJECT DOCUMENTS**

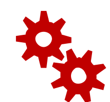
- Assumption log
- Change log
- Issue log
- Project schedule
- Risk register
- Stakeholder register

04 **AGREEMENTS**

05 **ENTERPRISE ENVIRONMENTAL FACTORS**

06 **ORGANIZATIONAL PROCESS ASSETS**





13.2 Plan Stakeholder Engagement Tools & Techniques



01 **Expert judgment**

02 **DATA GATHERING**

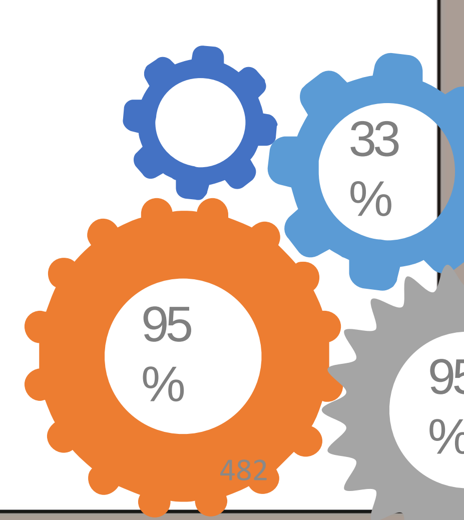
Benchmarking. The results of stakeholder analysis are compared with information from other organizations or other projects that are considered to be world class.

03 **DATA ANALYSIS**

- ✓ **Assumption and constraint analysis** : Analysis of current assumptions and constraints may be conducted in order to tailor appropriate engagement strategies.
- ✓ **Root cause analysis** : identifies underlying reasons for the level of support of project stakeholders in order to select the appropriate strategy to improve their level of engagement.

04 **DECISION MAKING**

- ✓ **Prioritization/Ranking** : Stakeholder requirements need to be prioritized and ranked, as do the stakeholders themselves. Stakeholders with the **most interest** and the **highest influence** are often prioritized at the top of the list.



G20 2019 Family Photo



Family Photo

FSB WTO ILO OECD MEX THA NLD VNM UN IMF ADB WHO WBG

Third row: 13

ESP EGY European Commission AUS GBR IND CAN ITA European Council SEN CHL SGP

Second row: 12

BRA FRA IDN CHN USA SAU JPN ARG RUS TUR KOR ZAF DEU

First row: 13



G20

ARGENTINA 2018

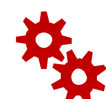
BUENOS AIRES



G20 OSAKA SUMMIT
2019

G20
2019
JAPAN

REUTERS



13.2 Plan Stakeholder Engagement Tools & Techniques



05 **DATA REPRESENTATION**

- **Mind mapping**

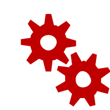
- **Stakeholder engagement assessment matrix.**



Supports comparison between the **current** engagement levels of stakeholders and the **desired** engagement levels required for successful project delivery.

The engagement level of stakeholders can be classified as follows:

- **Unaware.** **Unaware** of the project and potential impacts.
- **Resistant.** **Aware** of the project and potential impacts but **resistant** to any changes that may occur as a result of the work or outcomes of the project. These stakeholders will be **unsupportive** of the work or outcomes of the project.
- **Neutral.** **Aware** of the project, but **neither supportive nor unsupportive**.
- **Supportive.** **Aware** of the project and potential impacts and **supportive** of the work and its outcomes.
- **Leading.** **Aware** of the project and potential impacts and **actively engaged** in ensuring that the project is a success.



13.2 Plan Stakeholder Engagement Tools & Techniques



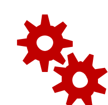
Stakeholder	Unaware	Resistant	Neutral	Supportive	Leading
Stakeholder 1	C			D	
Stakeholder 2			C	D	
Stakeholder 3				D C	

Figure 13-6. Stakeholder Engagement Assessment Matrix

C= Current Status **D= Desired Status**



MEETINGS



13.2 PLAN STAKEHOLDER ENGAGEMENT Output



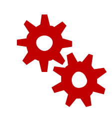
01 STAKEHOLDER ENGAGEMENT PLAN

- ✓ A component of the project management plan that identifies the strategies and actions required to promote **productive involvement** of stakeholders in decision making and execution.

- ✓ It can be formal or informal and highly detailed or broadly framed, **based on** the needs of the project and the expectations of stakeholders.

- ✓ The stakeholder engagement plan **may include** but is not limited to specific strategies or approaches for engaging with individuals or groups of stakeholders.





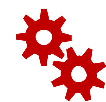
13.3 MANAGE STAKEHOLDER ENGAGEMENT

Legend:
New Item
Already Explained Item



Inputs, Tools & Techniques, and Outputs

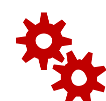
Inputs		Tools & Techniques		Outputs	
Project management plan (Communications management plan)	7	Expert judgment	35	Change requests	24
Project management plan (Risk management plan)	12	Communication skills (Feedback)	3	Project management plan updates (Communications management plan)	6
Project management plan (Stakeholder engagement plan)	8	Interpersonal and team skills (Conflict management)	6	Project management plan updates (Stakeholder engagement plan)	6
Project management plan (Change management plan)	4	Interpersonal and team skills (Cultural awareness)	4	Project documents updates (Change log)	2
Project documents (Change log)	6	Interpersonal and team skills (Negotiation)	5	Project documents updates (Issue log)	14
Project documents (Issue log)	12	Interpersonal and team skills (Observation/conversation)	3	Project documents updates (Lessons learned register)	29
Project documents (Lessons learned register)	27	Interpersonal and team skills (Political awareness)	5	Project documents updates (Stakeholder register)	12
Project documents (Stakeholder register)	17	Ground rules	1		
Enterprise environmental factors	40	Meetings	28		
Organizational process assets	47				



13.3 MANAGE STAKEHOLDER ENGAGEMENT



Data Flow Diagrams



13.3 MANAGE STAKEHOLDER ENGAGEMENT Input



01 PROJECT MANAGEMENT PLAN

- ✓ Communications management plan.
- ✓ Risk management plan.
- ✓ Stakeholder engagement plan.
- ✓ Change management plan.

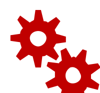
02 PROJECT DOCUMENTS

- ✓ Change log.
- ✓ Issue log.
- ✓ Lessons learned register.
- ✓ Stakeholder register.



03 ENTERPRISE ENVIRONMENTAL FACTORS (EEFs).

04 ORGANIZATIONAL PROCESS ASSETS (OPA).



13.3 MANAGE STAKEHOLDER ENGAGEMENT Tools & Techniques



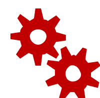
01 **EXPERT JUDGMENT**

02 **COMMUNICATION SKILLS**

- ✓ The methods of communication identified for each stakeholder in the **communications management plan** are applied during stakeholder engagement management.
- ✓ The project management team uses feedback to assist in understanding stakeholder reaction to the various project management activities and key decisions.
- ✓ Feedback may be collected in the following ways:
  - Conversations; both formal and informal.
  - Issue identification and discussion.
  - Meetings.
  - Progress reporting.
  - Surveys.







13.3 MANAGE STAKEHOLDER ENGAGEMENT Tools & Techniques

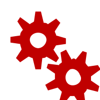


03 INTERPERSONAL AND TEAM SKILLS

- **Conflict management.** The project manager should ensure that conflicts are resolved in a timely manner.
- **Cultural awareness.** is used to help the project manager and team to communicate effectively by considering cultural differences and the requirements of stakeholders.
- **Negotiation.** is used to achieve support or agreement that supports the work of the project or its outcomes and to resolve conflicts within the team or with other stakeholders.
- **Observation/conversation.** is used to stay in touch with he work and attitudes of project team members and other stakeholders.
- **Political awareness.** is achieved through understanding the power relationships within and around the project.

33 %

95 %



13.3 MANAGE STAKEHOLDER ENGAGEMENT Tools & Techniques



04 **GROUND RULES**

Defined in the team charter as output of Plan Resource Management set the expected acceptable behavior for project team members, as well as other stakeholders, with regard to stakeholder engagement.

05 **MEETINGS**



13.3 MANAGE STAKEHOLDER ENGAGEMENT Output



01 **CHANGE REQUESTS**

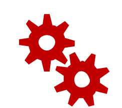
02 **PROJECT MANAGEMENT PLAN UPDATES**

- ✓ Communications management plan.
- ✓ Stakeholder engagement plan.

03 **PROJECT DOCUMENTS UPDATES**

- ✓ Change log.
- ✓ Issue log.
- ✓ Lessons learned register
- ✓ Stakeholder register.





13.4 MONITOR STAKEHOLDER ENGAGEMENT



Legend:
New Item
Already Explained Item



Inputs, Tools & Techniques, and Outputs

Inputs		Tools & Techniques		Outputs	
PMP (Resource management plan)	14	Data analysis (Alternatives analysis)	13	Work performance information	10
PMP (Communications management plan)	7	Data analysis (Root cause analysis)	6	Change requests	24
PMP (Stakeholder engagement plan)	8	Data analysis (Stakeholder analysis)	3	PMP updates (Resource management plan)	6
Project documents (Issue log)	12	Decision making (Multicriteria decision analysis)	8	PMP updates (Communications management plan)	6
Project documents (Lessons learned register)	27	Decision making (Voting)	7	PMP updates (Stakeholder engagement plan)	6
Project documents (Project communications)	4	Data representation (Stakeholder engagement assessment matrix)	4	Project documents updates (Issue log)	14
Project documents (Risk register)	22	Communication skills (Feedback)	3	Project documents updates (Lessons learned register)	29
Project documents (Stakeholder register)	17	Communication skills (Presentations)	2	Project documents updates (Risk register)	23
Work performance data	10	Interpersonal and team skills (Active listening)	3	Project documents updates (Stakeholder register)	12
Enterprise environmental factors	40	Interpersonal and team skills (Cultural awareness)	4		
Organizational process assets	47	Interpersonal and team skills (Leadership)	3		
		Interpersonal and team skills (Networking)	3		
		Interpersonal and team skills (Political awareness)	5		
		Meetings	28		



13.4 MONITOR STAKEHOLDER ENGAGEMENT



Data Flow Diagrams

Project Management Plan

Project management plan
- Resource management plan
- Communications management plan
- Stakeholder engagement plan

Project Documents

Project documents
- Issue log
- Lessons learned register
- Project communications
- Risk register
- Stakeholder register

4.3 Direct and Manage Project Work

- Work performance data

Enterprise/ Organization

- Enterprise environmental factors
- Organizational process assets

13.4 Monitor Stakeholder Engagement

4.5 Monitor and Control Project Work

- Work performance information

4.6 Perform Integrated Change Control

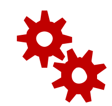
- Change requests

Project Management Plan

Project management plan updates
- Resource management plan
- Communications management plan
- Stakeholder engagement plan

Project Documents

Project documents updates
- Issue log
- Lessons learned register
- Risk register
- Stakeholder register



13.4 MONITOR STAKEHOLDER ENGAGEMENT Input



01 **Project management plan**

- ✓ Resource management plan.
- ✓ Communications management plan.
- ✓ Stakeholder engagement plan.

02 **Project documents**

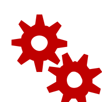
- ✓ Issue log.
- ✓ Lessons learned register.
- ✓ Project communications.
- ✓ Risk register.
- ✓ Stakeholder register.

03 **WORK PERFORMANCE DATA**

04 **ENTERPRISE ENVIRONMENTAL FACTORS.**

05 **ORGANIZATIONAL PROCESS ASSETS.**





13.4 MONITOR STAKEHOLDER ENGAGEMENT Tools & Techniques



01 **DATA ANALYSIS**

- Alternatives analysis.
- Root cause analysis.
- Stakeholder analysis.

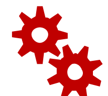
02 **DECISION MAKING**

- Multicriteria decision analysis.
- Voting.

03 **DATA REPRESENTATION**

- Stakeholder Engagement Assessment Matrix.





13.4 MONITOR STAKEHOLDER ENGAGEMENT Tools & Techniques



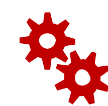
04 COMMUNICATION SKILLS

- **Feedback**. is used to ensure that the information to stakeholders is received and understood.
- **Presentations**. provide clear information to stakeholders.

05 INTERPERSONAL AND TEAM SKILLS

- **Active listening.** is used to reduce misunderstandings and other miscommunication.
- **Cultural awareness.** Cultural awareness and cultural sensitivity help the project manager to plan communications based on the cultural differences and requirements of stakeholders and team members.
- **Leadership.** Successful stakeholder engagement requires strong leadership skills to communicate the vision and inspire stakeholders to support the work and outcomes of the project.
- **Networking**. ensures access to information about levels of engagement of stakeholders.
- **Political awareness**. is used to understand the strategies of the organization, understand who wields power and influence in this arena, and to develop an ability to communicate with these stakeholders.

06 MEETINGS



13.4 MONITOR STAKEHOLDER ENGAGEMENT Output



01 **WORK PERFORMANCE INFORMATION**

02 **CHANGE REQUESTS**

03 **PROJECT MANAGEMENT PLAN UPDATES**
- Resource management plan.
- Communications management plan.
- Stakeholder engagement plan.

04 **PROJECT DOCUMENTS UPDATES**
- Issue log.
- Lessons learned register.
- Risk register.
- Stakeholder register.



Knowledge Areas	Project Management Process Groups				
	Initiating	Planning	Executing	Monitoring and Controlling	Closing
Project Integration Management	4.1 Develop Project Charter	4.2 Develop Project Management Plan	4.3 Direct and Manage Project Work 4.4 Manage Project Knowledge	4.5 Monitor and Control Project Work 4.6 Perform Integrated Change Control	4.7 Close Project
Project Scope Management		5.1 Plan Scope Management 5.2 Collect Requirements 5.3 Define Scope 5.4 Create WBS		5.5 Validate Scope 5.6 Control Scope	
Project Schedule Management		6.1 Plan Schedule 6.2 Define Activities 6.3 Sequence Activities 6.4 Estimate Activity Durations 6.5 Develop Schedule Management		6.6 Control Schedule	
Project Cost Management		7.1 Plan Cost Management 7.2 Estimate Costs 7.3 Determine Budge		7.4 Control Costs	
Project Quality Management		8.1 Plan Quality Management	8.2 Manage Quality	8.3 Control Quality	
Project Resource Management		9.1 Plan Resource Management 9.2 Estimate Activity Resources	9.3 Acquire Resources 9.4 Develop Team 9.5 Manage Team	9.6 Control Resources	
Project Communications Management		10.1 Plan Communications Management	10.2 Manage Communications	10.3 Monitor Communications	
Project Risk Management		11.1 Plan Risk Management 11.2 Identify Risks 11.3 Perform Qualitative Risk Analysis 11.4 Perform Quantitative Risk Analysis 11.5 Plan Risk Responses	11.6 Implement Risk Responses	11.7 Monitor Risks	
Project Procurement Management		12.1 Plan Procurement Management	12.2 Conduct Procurements	12.3 Control Procurements	
Project Stakeholder Management	13.1 Identify Stakeholders	13.2 Plan Stakeholder Engagement	13.4 Manage Stakeholder Engagement	13.4 Monitor Stakeholder Engagement	



THANKS

AND GOOD LUCK

TO BE PMP SOON

